

**UNIVERSITY OF CYPRUS
ESTATE STRATEGY UPDATE
AND
ATHALASSA
MASTERPLAN REVIEW**

Final Issue Draft 5 - 18.03.09



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DOCUMENT CONTEXT

This report broadly follows the structure of the original Master Plan report of August 1994, and subsequent Estate strategy reports, and reexamines the Masterplan report in the light of strategic, physical, environmental, behavioral and legislative changes which have influenced its development over the intervening years.

This report contains two work streams-

a) Estate Strategy.

The estate strategy looks at context of the whole university across all its sites in the context of the University's growth and aspirations.

b) Athalassa Masterplan Review and partial Update.

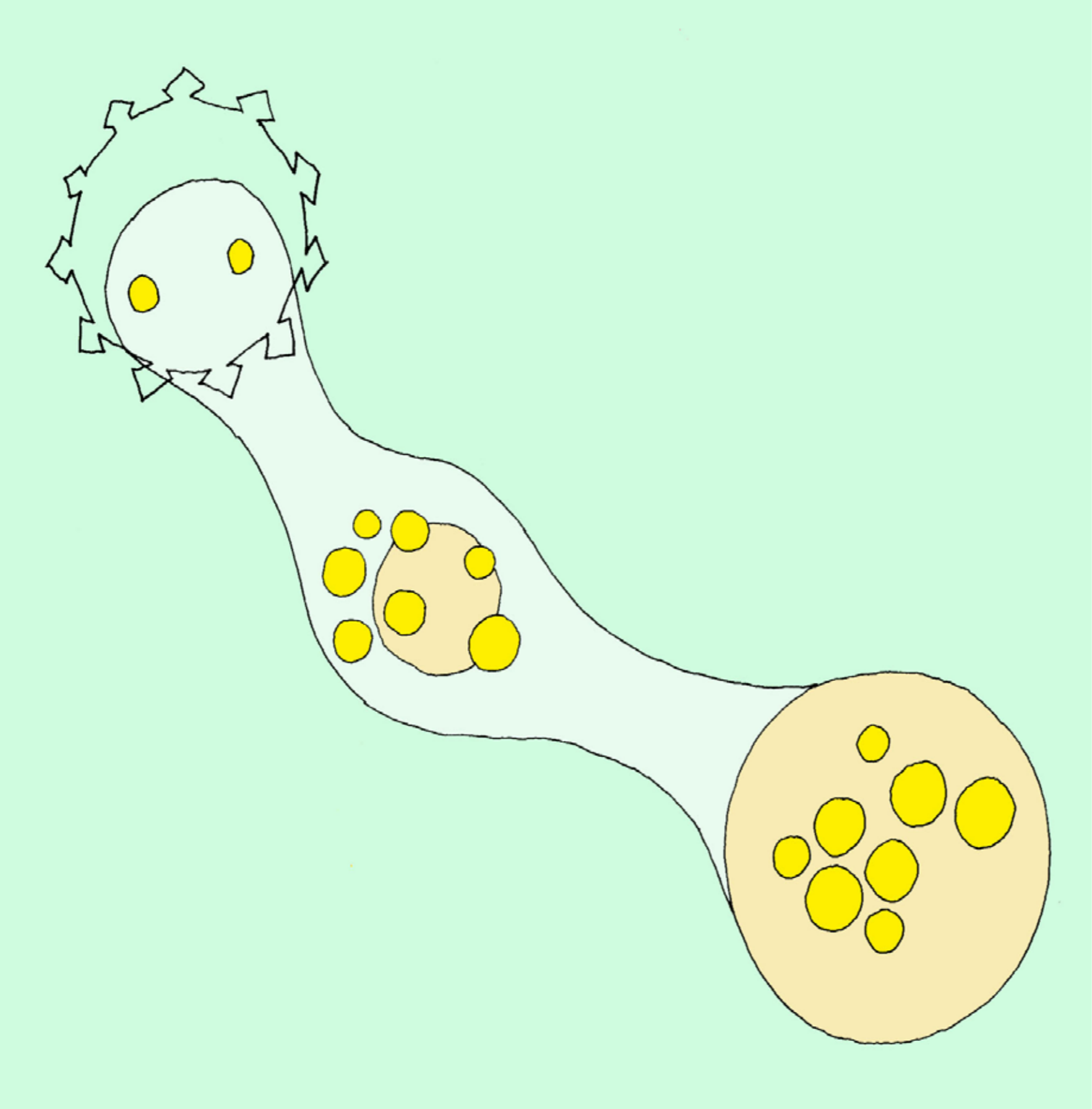
The Athalassa Masterplan was generated in 1994. The review covering all relevant consultant disciplines looks at the Masterplan's flexibility and success over the last 14 years.

Concurrent with the later stages of the Athalassa Masterplan Review the consultant team led by YRM have assessed how the Masterplan might be updated. This update is required to ensure the Masterplan's relevance and success into the future, a partial update was instructed by CDO and has been undertaken. This update has been incorporated into this report.

The draft brief for the Faculty of Engineering design competition is complete. Critical to the programme for this competition is the placing of the OJEU advertisement by CDO (programmed in November - awaiting University go ahead). By the time of competitors' shortlisting the design brief including the developed masterplan needs to be complete.

The competition for the Department of Biology and Common Teaching Three is also in progress. The current plan is that this competition should be commenced immediately once the Faculty of Engineering design team has been successfully appointed. It is not thought possible to run these two competitions concurrently due to administrative loads and to ensure the best market appetite.

ESTATE STRATEGY



I.00 ESTATE STRATEGY - EXECUTIVE SUMMARY

- I.01 The University of Cyprus has been legally established since 1989 and has taken students since 1992.
- I.02 The University of Cyprus has developed a broad based, high quality, research led University. It responds to and supports the National Strategic Development Plan, which underpinned Cyprus' successful accession to the EU in 2004.
- I.03 The Main (Athalassa) Campus is now well established with the principal scientific departments' buildings, and the first phase of student accommodation now occupied. A second major faculty, Economics and Management and the Social Facilities are in construction. The completion of these facilities in 2010 and 2009 respectively will add further critical mass and vitality to the campus. Administrative and support facilities also now exist, moving the centre of gravity of the University definitively to the Athalassa Campus.
- I.04 A programme for development is well established and the next projects in the programme are currently going through the design process. The LRC is awaiting approval to go to tender. The Department of Biology (permanent home) and Common Teaching 3 and the Faculty of Engineering have been approved and are at the stage of design competition document preparation.
- I.05 Despite the established development plan the human and academic growth of the University has substantially out paced the physical development, which has resulted in a range of ad-hoc and temporary solutions to meet short term needs.
- I.06 This has also necessitated the utilisation of 3 main teaching campuses (Athalassa, Academia and Latsia), and a proliferation of rented accommodation. In the short to medium term this status will continue.
- I.07 With the establishment of the Department of Architecture within the Old City, together with the long established cultural centre of Axiothea, the research centres and the Academia campus, the move to the University as an Institution integrated within the wider city has strengthened further.
- I.08 Whilst this integration has positive cultural aspects, it is a challenge to the intensity of the student experience and the desired holistic education model. It will therefore be necessary in the medium term to consolidate and focus new capital investment on permanent facilities on the Athalassa Campus and the route between the three permanent centres- Athalassa, Academia and the Old City.
- I.09 It is therefore important to establish what range of roles the Athalassa site might play as the University continues to develop and mature, and ultimately what the 'capacity' of the site might

be. Whilst the establishment of other Universities, (including privately funded ones) has assisted the drive to widen access to higher education, there needs to be a long term safeguard for high-quality research and development that will grow out of the proximity to the physical and human investment already made at Athalassa.

The dialogue has already commenced with the Town Planning Department, who wish to understand this longer term vision in order that its impact on the wider picture can be gauged.



The University Masterplan as illustrated in the 1994 report

2.00 INTRODUCTION

2.01 Estate Strategy Context

YRM, and other strategic advisory consultants, have worked with the University since its inception. Their role was initially to formulate the suite of strategic masterplan documents which established a framework for the physical growth of the University.

As part of their ongoing advisory works to the University's Campus Development Office YRM have periodically reviewed the progress of the Athalassa Campus Development and the Masterplan. This has been widened to include an assessment of all the sites occupied by the University in an Estate Strategy. A number of reports have been produced and presented including the 'DEVELOPMENT PLAN 2000-2010', issued in the summer of 2001. The intention of this 10-year development plan was to provide a technical document to support discussions on the campus Masterplan with the Government of Cyprus, and potential EU funders.

The Estate Strategy report has been updated three times with the last being issued in mid 2006. This document further updates this strategy.

The University's Estate Strategy is more 'open-ended' than formerly. Due to the growing number of temporary (and not so temporary) facilities run by the University, the Estate Strategy needs to consider the growth of the Athalassa Campus and the continuing use and/or decommissioning of the other University facilities, in an integrated manner.

The 'Masterplan Review' was commissioned by the University of Cyprus through CDO in February 2008. The original Masterplan was completed in 1994 and was in need of comprehensive review in the light of the experience of its implementation; the changed political and legislative circumstances in Cyprus and the passage of time.

This report broadly follows the structure of the original Masterplan report of August 1994, and subsequent Estate strategy reports, and reexamines the Masterplan report in the light of strategic, physical, environmental, behavioral and legislative changes which have influenced its development over the intervening years.

This report has been produced by many of the same team of consultants who jointly created the Masterplan recommendations with the Campus Development Office.

2.02 Establishment of the University

In 1989 all university graduates in Cyprus received their degrees overseas. This was costly for students and their families and inevitably some students were attracted to stay overseas rather than returning to Cyprus.

The University was established by law in 1989 and admitted its first students in the academic year 1992/3. Admission to the University remains highly competitive and the ratio of candidates to admissions is more than 5:1

The University aims to provide a broad based undergraduate education concentrating on areas of national strength – i.e. sciences, service

industries and professionally based subjects. The University also aims to become a centre of excellence in the Mediterranean region and an internationally recognised research university responding to the country's strategic need.

Potential students have been attracted to the high quality facilities at the University of Cyprus and there is a pressure for further growth.

Since the establishment of the University, there has been a steady increase in the number of Cypriot students remaining in Cyprus for tertiary education (44 - 60%), and the University of Cyprus has taken an increasing proportion of this growth.

With the establishment of two other public Universities in Cyprus, and the licensing of a number of private universities, extra capacity has been introduced.

However there are a range of areas of study and research where a policy of centralisation will be essential to make the most effective use of resources.

2.03 University Mission

The stated main objectives of the University of Cyprus are twofold: "the promotion of scholarship and education through teaching and research, and 'the enhancement of the cultural, social and economic development of Cyprus'.

In this context the University believes that education must provide more than simply accumulation of knowledge.

It must also encourage students' active participation in the process of learning and acquisition of those values necessary for responsible and active involvement in the community. The University sets high standards for all branches of scholarship.

Research is promoted and funded in all departments for its contribution to scholarship in general and for its local and international aspirations."⁽¹⁾

⁽¹⁾Main objectives of the University - quoted from the University of Cyprus Postgraduate Prospectus 2006.



Current and potential members of the European Union as of 2004



Public Universities in Cyprus (yellow). Private Universities (orange).

The aims of the University are as follows:

- to provide high-quality tertiary education, both at the undergraduate and graduate levels;
- to contribute to the enhancement and production of knowledge to meet the needs of society, culture, civilization and economy in both Cyprus and the region;
- to participate actively in the academic and research community of Europe and elsewhere;
- to interlink directly with the economy and technology both in Cyprus and Europe;
- to contribute to the social development of Cyprus in various fields such as the arts, education etc.

This statement has been formulated to define the University's vision of its role and how it may contribute to the educational and social development of Cyprus. Further, the University's vision considers the role of the country in relation to the Mediterranean and Europe. Specifically, the University envisages the country as a knowledge society, which, actively and cooperatively with Europe and the region, participates in the development of civilization, culture and the economy.

The University of Cyprus plays a unique role in the realisation of the national vision.

2.04 Current Strategic Context

On 1 May 2004, Cyprus officially became a member of the European Union. Cyprus has a market economy dominated by the service sector, which accounts for 76% of GDP. The economy grew a healthy 3.7% per year in 2004 and 2005, well above the EU average. Cyprus joined the European Exchange Rate Mechanism (ERM2) in May 2005. EU accession was achieved in May 2004 and Cyprus adopted the Euro in January 2008.

The 1999-2003 plan and the subsequent outline Strategic Development Plan 2007-2013 both set out a strategy for the progressive development of Cyprus as a provider of high quality services. The specific objectives for training, continuing professional development, uses of information technology, scientific and technological research are set out in detail in the 1999-2003 plan, with the 2007-2013 plan also aiming to maintain and support the high educational standards of the workforce.

The 2007-2013 Plan also outlines the plan for Cyprus to act as a bridge for economic cooperation between Europe and the Middle East and to promote social cohesion in all aspects of society.

In 1999 research activities in Cyprus only constituted 0.2% of GDP. It was the government's objective to raise this substantially through the periods of the Strategic Plans, and the research activities of The University were vital to achieving this objective.

2.05 Higher Education in Cyprus

Whilst the University of Cyprus has had great success in attracting students of high calibre and in achieving the required growth of Cyprus based student numbers, it has been recognised that a broader base of higher education is required in Cyprus. This broader base is specifically aimed at more technical education and also at higher education outside Nicosia.

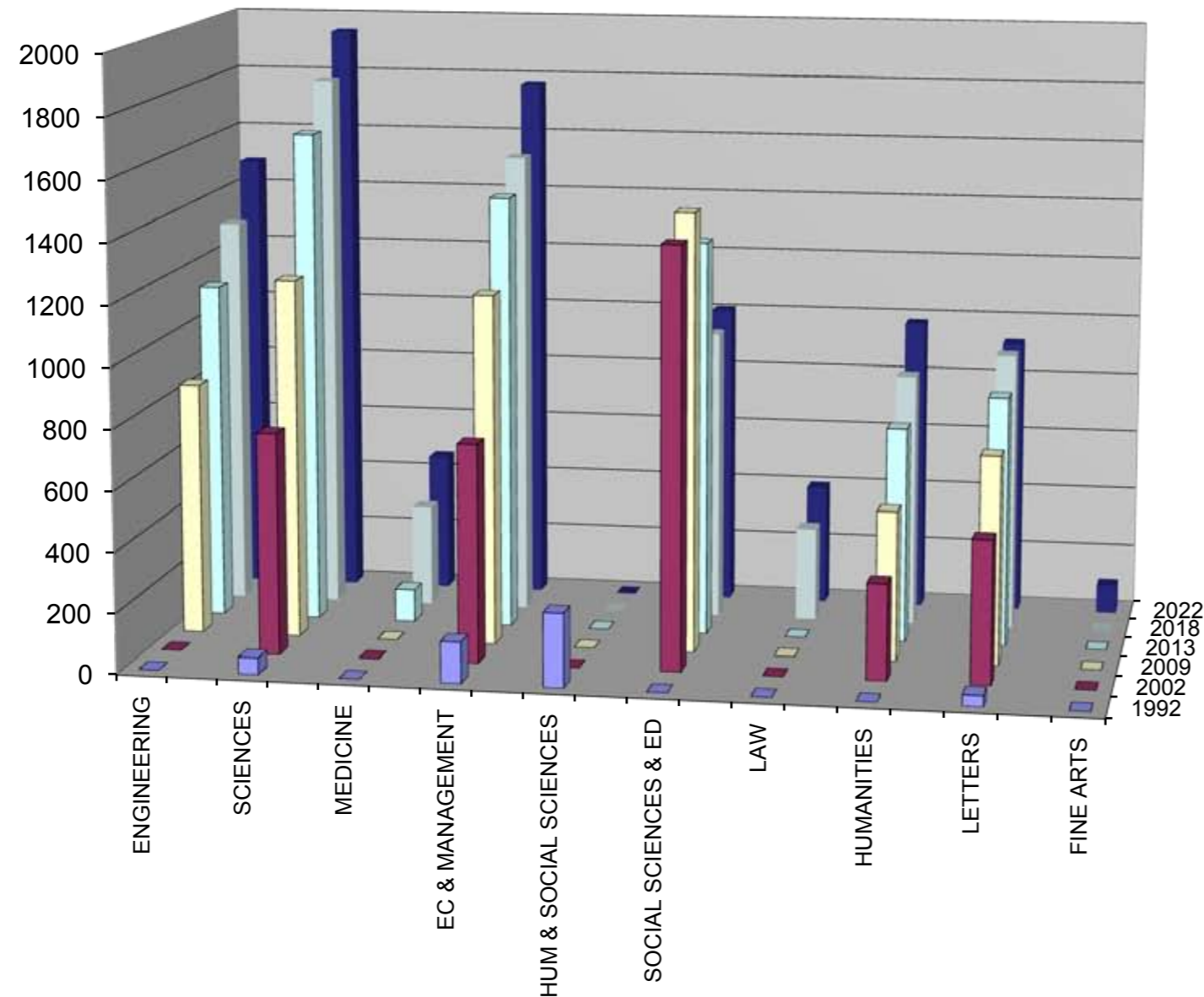
In December 2003 the law for the establishment of the 'Technological University of Cyprus' was approved and the University took its first students in 2007/8. This second University has the following initial faculties:

- Faculty of Technological Applications
- Faculty of Health Services
- Faculty of Administration and Finance
- Faculty of Geotechnical Sciences and Environmental Management
- Faculty of Arts and Communication

Additionally in order to realise the goal of lifelong learning in Cyprus an Open University of Cyprus has been established whose programme encompasses a degree programme in Greek Civilization and postgraduate programmes in Health and Education.

There are also a number of proposed private universities in Cyprus permitted under legislation passed in 2007. Three of these have now been granted University status.

In the original masterplan and the subsequent 10 year plans the final milestone was the point at which all the students of the University of Cyprus were to be located on the new campus. This report suggests that this should no longer be the long term campus strategy. Again, it no longer seems appropriate to limit the growth of the University by the capacity of the Athalassa Campus.



3.00 GROWTH STRATEGY

3.01 Corporate Governance

The University is a public corporate body. It is governed by the Council and the Senate. The Council is responsible for the management and control of the administrative and financial affairs of the University and its property. The Senate is the highest academic body of the University and is responsible for the academic affairs of the University, both teaching and research.

The Faculties and Departments are administered by Boards; each Faculty is headed by a Dean and each Department is headed by a Chairperson.

3.02 University Organisation

The University of Cyprus currently offers programmes through the following six faculties and departments. A Department of Law has been established within the Faculty of Social Sciences and Education. It is proposed that Law becomes an independent Faculty in due course. The further faculties in Medicine and Fine Arts are also under consideration.

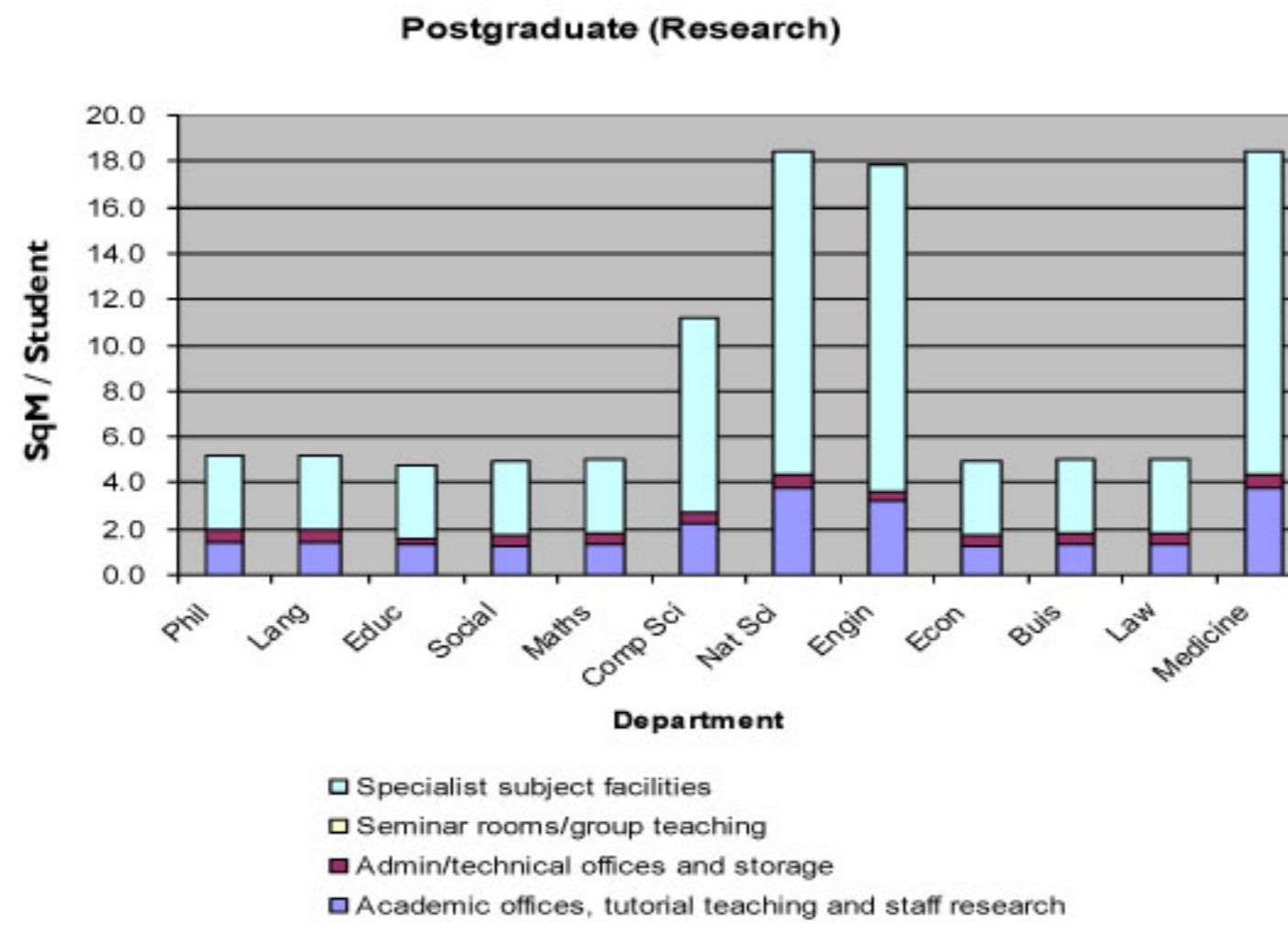
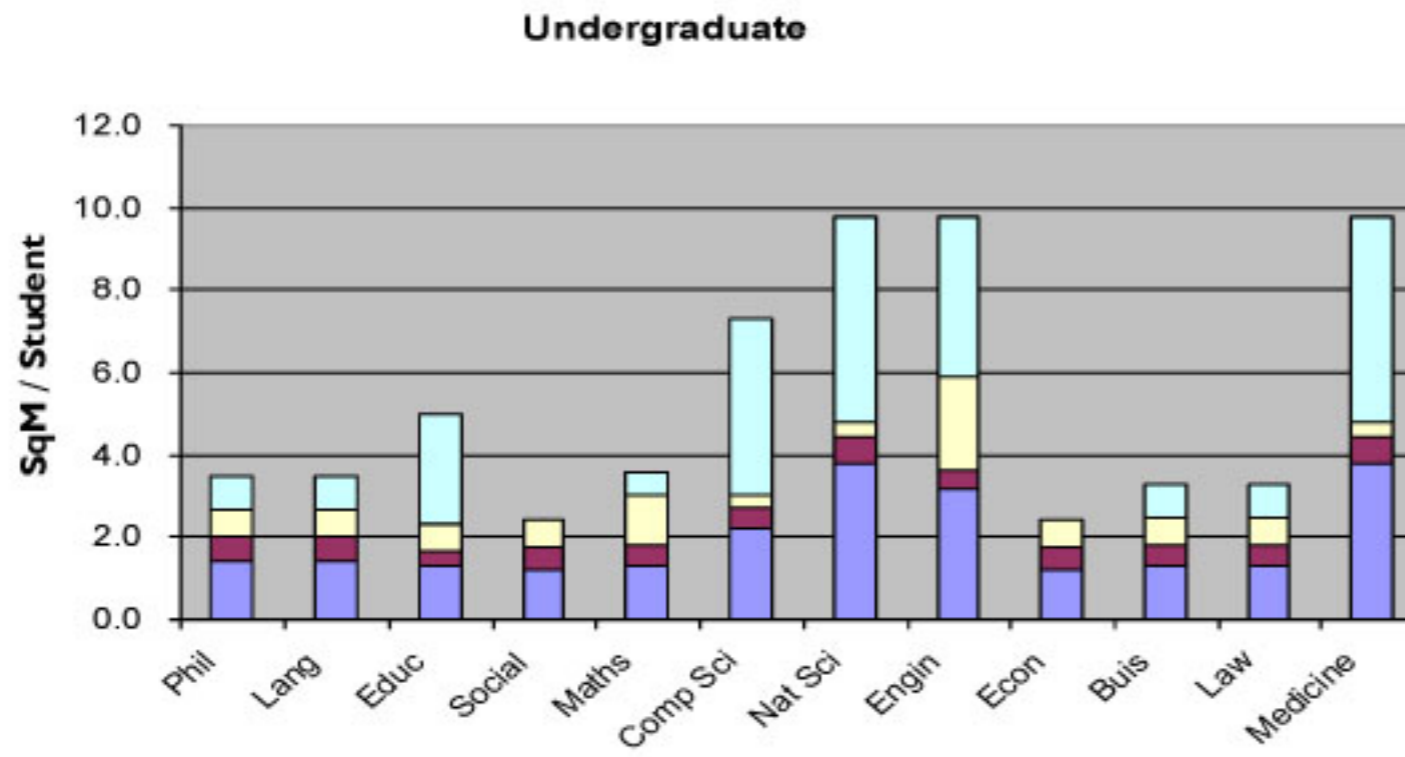
1. **Faculty of Humanities**
with Departments in
 - English Studies
 - French Studies and Modern Languages
 - Turkish Studies and Middle Eastern Studies
2. **Faculty of Social Sciences and Education**
with Departments in
 - Education
 - Social and Political Sciences
 - Psychology
 - Law
3. **Faculty of Letters**
with Departments in
 - Byzantine and Modern Greek Studies
 - History and Archeology
 - Classics and Philosophy
4. **Faculty of Pure and Applied Sciences**
with Departments in
 - Mathematics and Statistics
 - Computer Sciences
 - Chemistry
 - Physics
 - Biology
5. **Faculty of Economics and Management**
with Departments in
 - Public and Business Administration
 - Economics
6. **Faculty of Engineering**
with Departments in
 - Electrical and Computer Engineering
 - Mechanical and Manufacturing Engineering
 - Civil and Environmental Engineering
 - Architecture

7. Other Centres

There is also a growing language centre (attached to the Faculty of Humanities) and a number of separately constituted research centres including the 'Economics Research Centre' and the 'HERMES Centre of Excellence for Computational Finance and Economics' both within the Faculty of Economics and Management. The 'Archaeological Research Unit' is associated with the Faculty of Letters.

3.03 Academic Growth

Between the years 1992-2002 the original Faculty of Humanities and Social Sciences split to form 2 Faculties: The Faculty of Humanities and the Faculty of Social Sciences and Education. After separating out the Department of Education students (approximately 1,000 FTE) the university had five roughly equivalent sized Faculties by 2002.



A report by external consultants EUA (European Universities Association) on the academic development strategy for the University was completed in 2001. The EUA also undertook a follow up evaluation in 2005. These reports recommended that the University considered carefully its plans to expand into other study fields in order to balance 'expansion' and 'excellence'. EUA recommended that this consideration took account of the 'crucial external parameters' such as the available resources and the development of the new campus.

By 2008 six faculties have been established: Pure and Applied Sciences, Humanities, Social Sciences and Education, Economics and Management, Letters and Engineering.

The Faculties of Law and Medicine have also been approved. A department of Law within the Faculty of Social Sciences and Education took its first limited intake in 2008/9. A feasibility study has also been undertaken for the establishment of a Faculty of Fine Arts but this falls into a longer time-scale in the estate strategy.

Between 2008 and 2013 all faculties predict further growth, some of which is evident in recent intakes. Step change growth is predicted in the Faculty of Pure and Applied Sciences due to the commencement of Biology and in the Faculties of Engineering and Law due to the enlargement of the undergraduate student teaching. The increase in numbers in Economics and Management represents a doubling of the proposed intakes in both departments over this period.

Between 2013 and 2022 it is proposed that there may be further Faculties commencing. For the seven existing faculties the growth curve flattens beyond 2022.

The ratio of Undergraduate to Post graduate students has changed from 17:1 in 1992 to 5:1 in 2006, with a target of 3:1 by 2020. This shows the increasing emphasis on research within the University which has consequential estate implications.

The graphs to the left show benchmarked area norms for undergraduates and research post graduates by discipline. The extent of the additional accommodation required for the Sciences, Engineering and Medicine can be seen.

3.04 Areas per Student

Although the long term growth of the university envisages a broad equivalence of the faculties with regard to student numbers, this will not translate into similar sizes of faculties when constructed.

The Science and Engineering faculties require some 4 times the unit area per undergraduate student than the Humanities and this divergence is exacerbated for postgraduate and research students.

A further level of difference is generated by the unit cost of the space which is generally both more highly serviced and with more expensive equipment, in the Science and Engineering Faculties.

Many world class Universities reflect this cost disparity in their fee structure.

3.05 Student Numbers

For the academic year 2007/2008 University enrolment totalled over 5400 students, comprising over 4100 undergraduate students and over 1300 graduate students. There is pressure in all areas for planned and controlled growth.

The graph below, based on actual numbers to date, includes the period of constrained growth between the years 1995-2000. Predicted growth from 2008 is built up from the student number projections for each Faculty and shows a growth to 10,000 students by 2025.

Currently around 80% of Cypriot students continue with some form of tertiary level education, a very high percentage by international standards. Of the estimated 34,000 Cypriot students some 15,000 are in Cyprus (with the University supplying approximately 36% of these places). The remainder of students (some 56%) are studying overseas.

The medium term demand for student places at The University of Cyprus could, therefore, be considered against the following criteria: -

- The population of the government controlled area of Cyprus is predicted to be around 850,000 by the year 2017.
- A potential 12,000 people a year will therefore complete full-time secondary education.
- If 80% of these require tertiary education 9,600 places of various

types will be required.

- If an increasing percentage of these numbers remain in Cyprus with 30 - 35% of these places being supplied by The University of Cyprus, The University would require a yearly intake in the order of 2000FTE.
- This equates to around 7800 - 8000 FTE Cypriot students in undergraduate education at the University of Cyprus (assuming 4 year courses).
- The existing undergraduate: postgraduate ratio is 5:1 but as the University develops its mature research base, this may reduce to lower than 4:1. If this occurs The University may require up to 2500 FTE postgraduate places.

A University of 10,000 students is therefore envisaged as the medium term planning benchmark. Beyond this point it is likely the quality of students would diminish, and the additional demand is likely to be taken up by private sector institutions and other specialist providers.

In the long term it is essential to safeguard for the impact of a solution to the Cyprus problem, which would create a major stimulus to demand. Whilst the population of the occupied areas is uncertain, it is estimated as around 240,000 of which a minimum of 90,000 persons have rights as citizens of Cyprus. This could generate in the order of a further 1250 FTE students a year.

Whilst it is likely that the Academia Campus, and facilities within the old city will continue to form part of the University Estate, it would appear prudent to test whether the Athalassa site is capable of sustaining a student population in the order of 12,000 - 14,000.

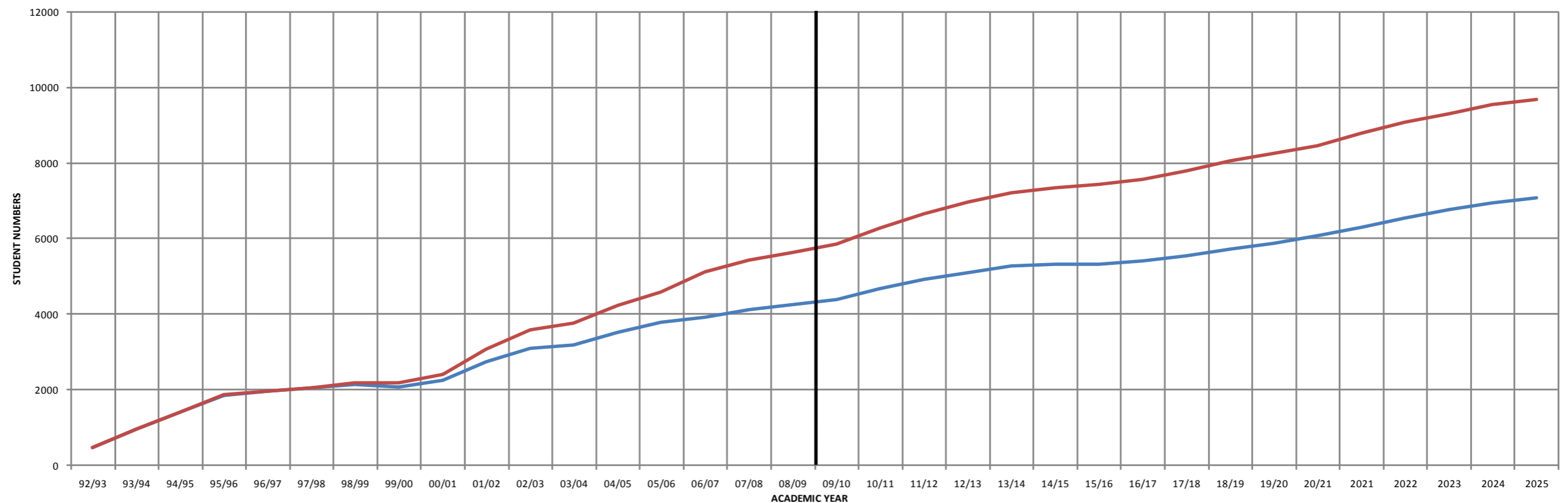
3.06 Staff Numbers

There are currently 622 (permanent and non-permanent) academic staff employed by the University. This gives a staff student ratio of 1:8.3. However the ratio of permanent staff (253) to students is closer to 1:20. This indicates that it is likely that the University has become increasingly reliant on its non permanent teaching staff. (These non-permanent academic staff may be the previously uncounted mentioned in section 4.02)

There are currently 393 (permanent and non-permanent) administrative Staff employed centrally and within departments. Of these 233 are permanent staff giving a ration of 1:1.09 administrative to academic staff ratio.

The University of Cyprus Strategic Development Plan 2004-2020 suggested that when the University achieves full growth with 10,000 students there should be around 1,000 academic and 1,000 administrative staff.

In assessing the site capacity of 13,000 students, further growth of both academic and administrative staff will be inevitable.



Red - Total Student Numbers
Blue - Undergraduate Student Numbers

UNIVERSITY OF CYPRUS
ATHALASSA CAMPUS
AREA COMPARISON FOR CAPACITY STUDIES

	Masterplan assumptions for 4300 FTE	Status	Current assumption for 10,000FTE	Growth
Completed buildings				
Maintenance and Service Buildings	4,275	Occupied	5,400	
Administration	4,307	Occupied	10,000	
Faculty of Sciences	10,793	Occupied	19,240	
Common Teaching 1	1,616	Occupied	2,868	
Indoor Sports Hall	3,367	Complete	7,545	
Phase 1a Housing	8,589	Occupied	6,555	
SUB TOTAL	32,947		51,608	57%
Buildings at tender/ construction stage				
Research Unit 1 (Sciences)	675	Construction	2,657	
Social buildings	7,625	Construction	11,990	
Faculty of Econ & Man	3,895	Construction	9,785	
Common Teaching 2	1,044	Construction	7,637	
Research Unit 2 (E&M)	675	Included above		
Learning Resource Centre	12,018	Designed to Tender	15,161	
SUB TOTAL	25,932		47,230	82%
Next phase projects				
Dept of Biology	-	Brief/ planning	7,226	
Common Teaching 3	-	Brief/ planning	4,556	
Faculty of Engineering	8,514	Brief/ planning	22,001	
Research Unit 3 (Eng)	675	Included above		
SUB TOTAL	9,189		33,783	268%
Other planned projects				
Faculty of Humanities	4,956	Brief only	4,853	
Faculty of Letters	inc above	Brief only	5,266	
Common Teaching 4	3,363	Brief only	3,024	
Research Unit 3 (Hum)	675	inc above		
Faculty of Soc. Sci. & Education	3,555	Brief only	8,757	
Language Centre		Expanded	1,000	
Research Unit 5 (Ed)	675	inc above		
Faculty of Law	-	Brief only	2,417	
Dept. of Pre-Clinical Medicine	-	Brief/ planning	7,795	
Cultural Centre	3,057	Brief/ planning	15,911	
Phase 1b Housing	8,589	Brief only	15,000	
Phase 2 housing (a and b)	17,178	Brief only	34,450	
Multi storey car parks	-	Sports	15,500	
Multi storey car parks	-	South West	18,750	
Multi storey car parks	-	Northern edge	55,000	
Ancillary sports facilities (Ph 2)	1,965	Design complete	2,178	
Clinical Medicine	-	Brief only	8,228	
Faculty of Engineering (phase 2)	-	Brief/ planning	3,273	
Western FE (Innovation Centre)	-		9,900	
Southern Area Plot 4	-		2,979	
Storage Extension	-		1,000	
Maths or CompSci Building	-		5,949	
Faculty of Engineering (phase 3)	-		4,974	
Faculty of Econ & Man - Ext	-		754	
Common Teaching 5	-		6,465	
Faculty of Fine Arts	-		3,830	
Administration 02	-		5,000	
SUB TOTAL	42,048		142,597	239%

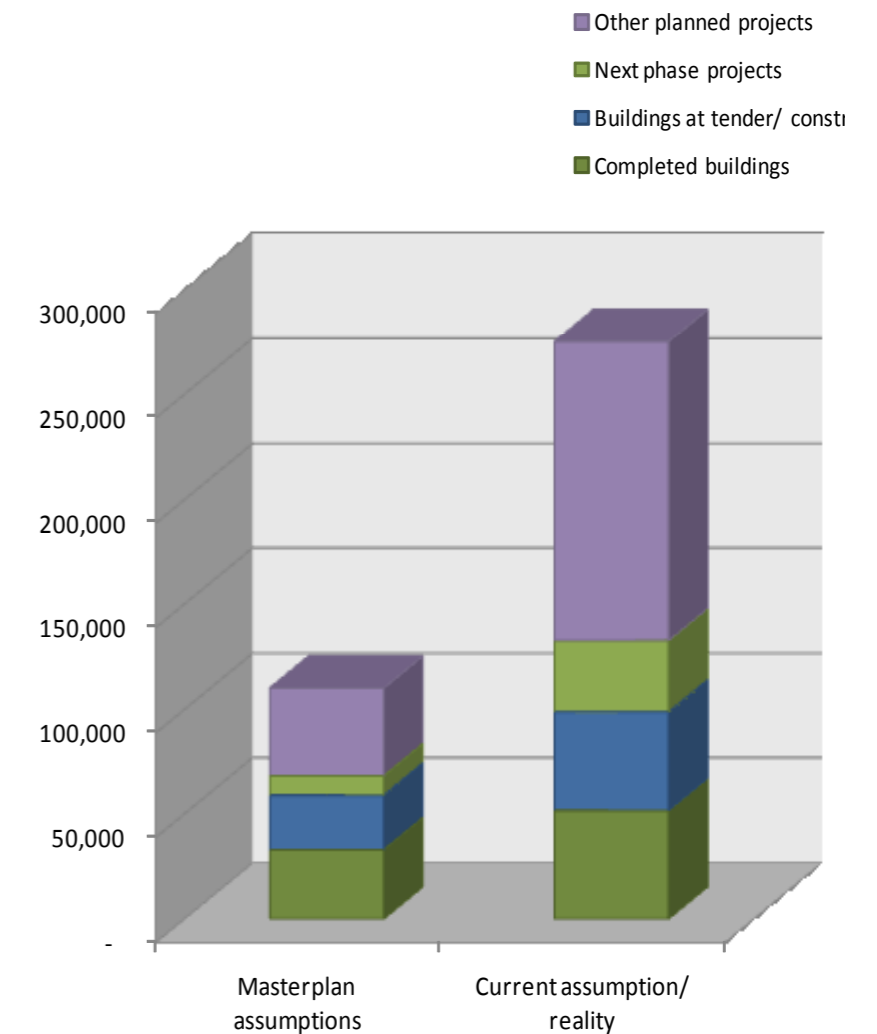
3.07 Achieved Building Areas

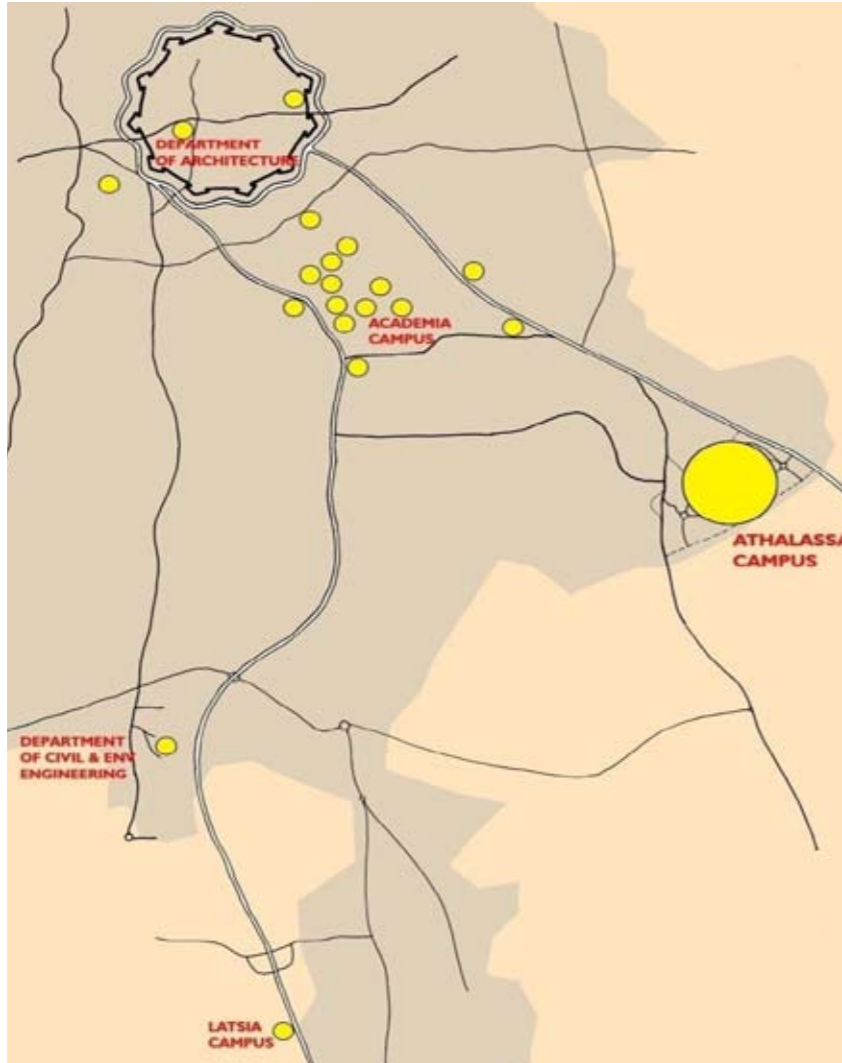
All the buildings constructed, and currently planned, exceed the areas predicted at the 1994 masterplan stage. This has the following principal causes:

- 1) The growing size of the departments and the University as a whole means that the net areas required are larger and more numerous to accommodate more students and staff.
- 2) The shifting of the University character towards research also causes an increase in the required Net areas.
- 3) The ratio of net area: gross area has not been achieved as originally planned and has been recalculated to respond further to local needs.

In planning future buildings (and in assessing future capital costs), the norms achieved to date have been used as the basis for future prediction.

In summary, as shown in the histogram below, it is now envisaged that planned projects identified and programmed today will have a built-up area double that envisaged in the 1994 Masterplan for 4300 students.





Current locations of University Buildings within Greater Nicosia.

4.00 ESTATE STRATEGY

4.01 The 1994 Masterplan Strategy

The original masterplan assumed the “temporary” Academia Campus would be vacated as the new Athalassa campus matured, with the latter taking 4300 FTE (Full Time Equivalent students) with a planning safeguard for up to 8000 students.

By 1998 this had risen to 5200 students, with a longer term utilisation of the Academia Campus, short-term temporary use of the Latsia Campus, and the utilisation of a range of buildings on leases of varying lengths.

A more extended approvals process than originally envisaged, faster growth of departments and the initiation of the Faculty of Engineering have all added to a proliferation of temporary space, leading to a University much more distributed within the City of Nicosia, and much more integrated into its daily life than originally envisaged.

Whilst some consolidation is now essential, the basic relationship that has developed between the University and the city could present potential for future development within the framework of the new Estate Strategy.

4.02 The Evolving Estate Needs

The universal international pressure to educate a greater proportion of 18 year olds to tertiary levels, together with the rise of mature students and whole life learning, suggest a single site strategy is now neither feasible or desirable. The estate strategy for the university should not set any specific limit for student numbers, but rather seek, as it has done to date, to generate additional capacity when need arises.

It is however clear, that the current proliferation of temporary buildings is unsustainable both financially and operationally and that there must be urgent planned consolidation into high-quality permanent facilities on a smaller number of sites.

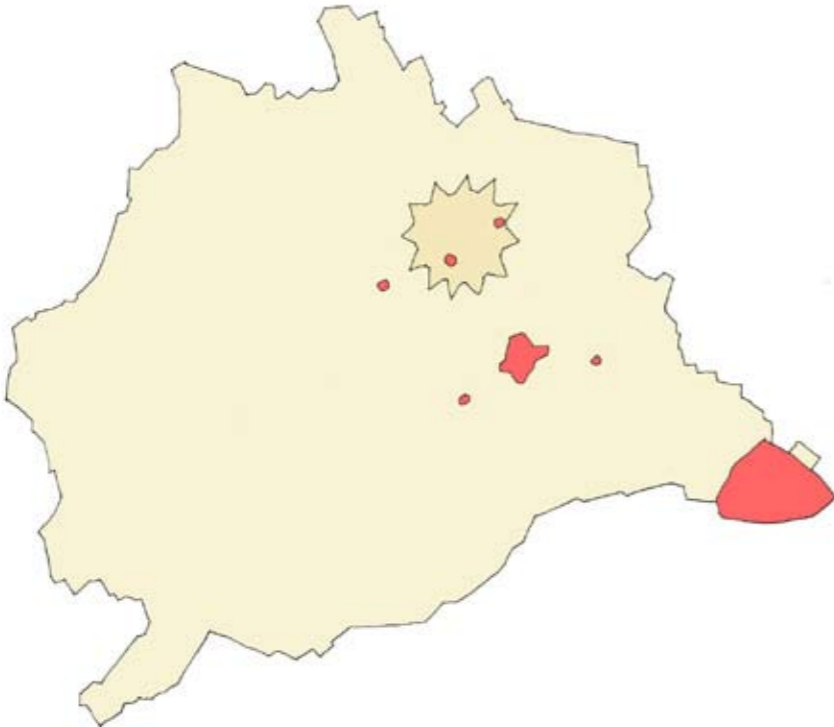
The current development plan suggests a campus of around 10,000 FTE students at Athalassa in mixed Faculties with a potential to use both the accessible, and currently inaccessible, areas of the southern portion of the site for a mix of residential and applied/ collaborative research uses. The capacity of the Athalassa Campus is currently constrained by planning law, but could be raised if purely operational limits were considered.

The current Athalassa masterplan limits the amount of student residential accommodation to 1734 students. Options as to where this might best be provided are discussed later in this report.

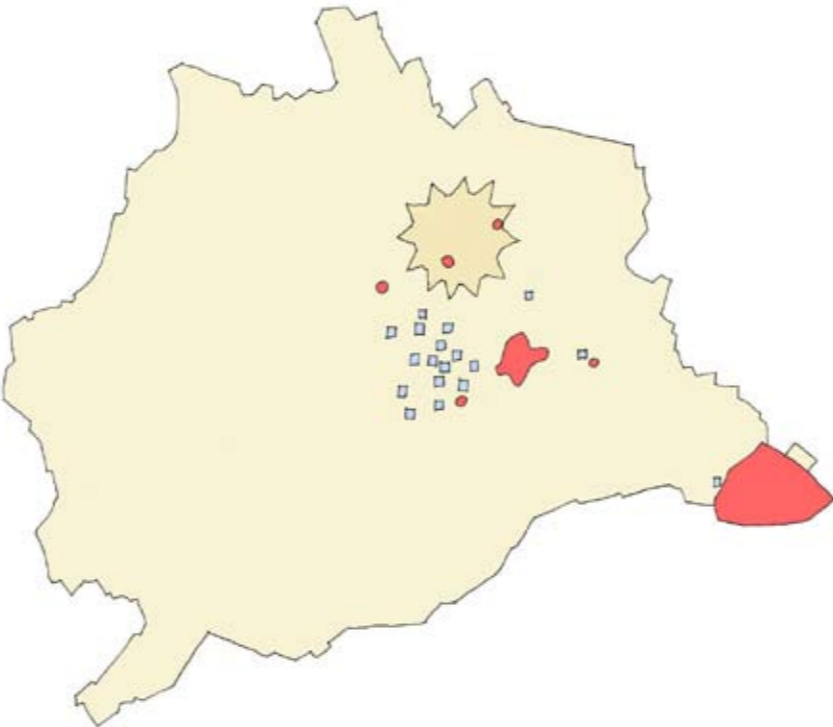
The traffic and transport strategy as set out in the original masterplan has also developed through time. Of particular concern is the increase in private vehicle ownership - particularly amongst the students - which will necessitate far greater provision and/or controls on parking. A green Transport plan will be essential in the future, for which a policy framework urgently needs developing. This is set out in more detail in section 4 of the Traffic and Transport Report. (Chapter 11)

The type of accommodation required by each department has also evolved since the issue of the 2000-2010 plan. The increasing emphasis on research within all departments has led to a changing space requirement, as the needs of the undergraduate and postgraduate student differ considerably. The research needs of Faculties particularly in the Scientific and Engineering disciplines are also more ambitious, and across the University there are an increasing number of specialist research groups.

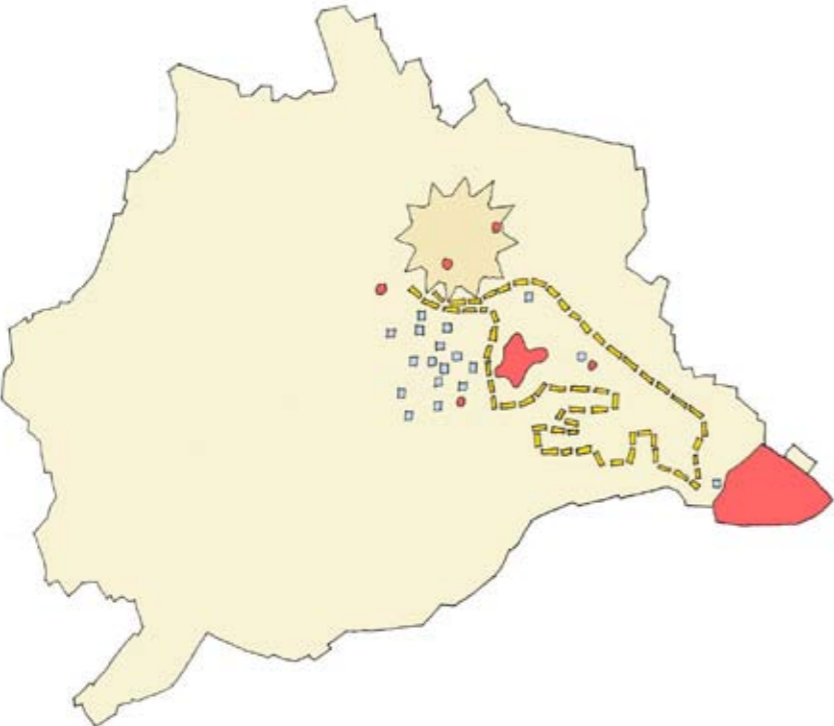
The increasing emphasis on research has had an impact on all faculties. A large number of informal members of the University, previously uncounted, now exist. These research assistants are not counted in the staff numbers but in some departments effectively double the official departmental faculty headcount. The estate implication of these additional people needs further consideration in order that an appropriate, sustainable, and funded allowance can be incorporated into the evolving briefs for new buildings.



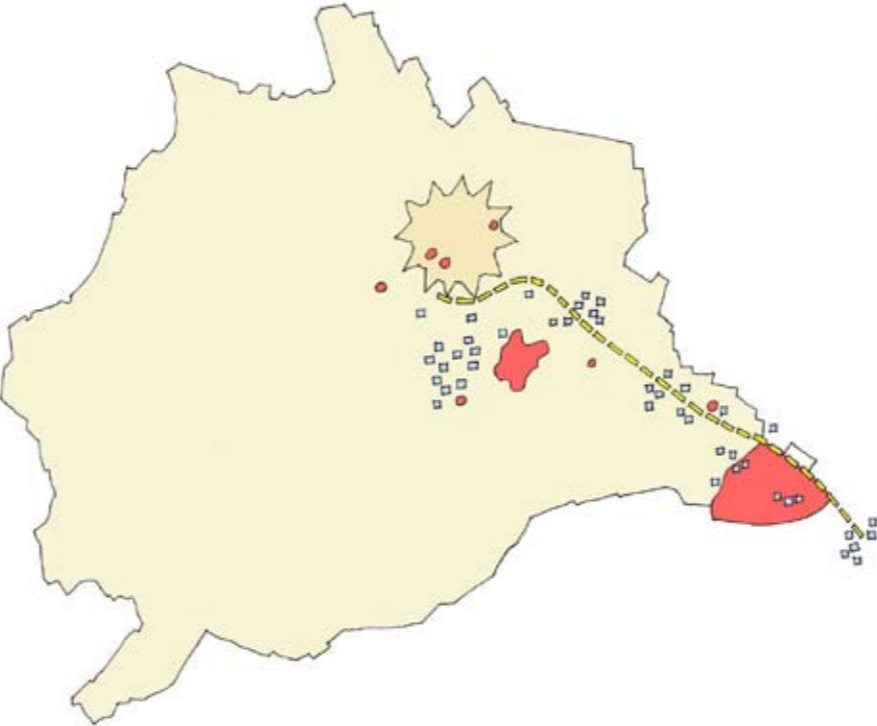
Consolidated Academic Centres



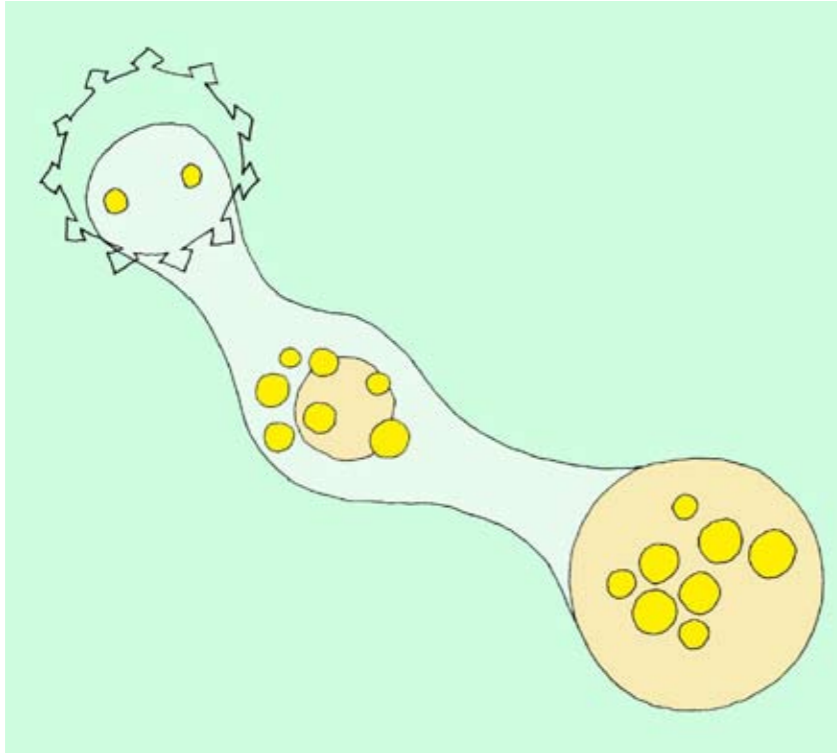
Academic Centres and fragmented private sector student housing



Existing inter-campus public transport



Proposed public transport as a campus link. University and private sector student housing concentrated along public transport routes.



An emerging site strategy for the University of Cyprus. Three centres - the Main Athalassa Campus growing, consolidation of the buildings on and around the Academia Campus, and a foothold in the old city.

4.03 The Emerging Estate Strategy

- The emerging Estate Strategy is a three centred University (Old City, Academia and Athalassa) with developed zoning, town planning and transport strategies linking the three centres.
- The transport corridor between the three centres should include Kallipoleos-Kyrenia Avenues and Larnacos Avenue as well as the in-between spaces and their immediate periphery.
- The development of public transport in the linking corridors needs to be integrated into the greater Nicosia transport plan. An emphasis on accessibility should aid in the development of sustainable transport planning.
- The development of this linked strategy could be expanded through cooperation with the Town Planning Authority to introduce 'ladder links' between the main transport routes creating links for pedestrians (to bus routes) and for bicycles away from the highly trafficked routes.
- The three centred University integrates more into the city of Nicosia giving the city some of the social benefits associated with a thriving academic community.

OLD CITY

- With the establishment of the Department of Architecture in the Old City, together with the existing cultural centre of Axiothea and the research centres, a new focus for the University is emerging with a cultural emphasis.
- Having a presence in the old town links the University to the city. Some departments think this link to the historic city is important educationally. The link also promotes social and cultural integration.

ACADEMIA

- To date the Academia Campus has had a major role to play as the secondary teaching centre. It was recognised in 1994 that the Academia Campus was likely to be a major teaching centre for some time - due to constraints on the speed of the developments on the Athalassa Campus - the medium to long term occupancy of the Academia site being essential to minimise double moves.
- In order to enhance this role for the Academia Campus, old prefabricated buildings were demolished and replaced by new buildings of high quality. These buildings, purpose designed for educational use, now constitute a significant and valuable investment for the University and nation.
- Although the majority of the University (particularly the undergraduates) will be housed at Athalassa the Academia campus remains important. It is envisaged that Academia will be used in the future predominantly for post graduate Arts students, Arts based subject research units and the base for the development of the Arts.
- There is a fledgling plan for the National Library to have a base on the Academia campus.

ATHALASSA

- The original Masterplan assumed that all students would ultimately be located on the Athalassa Campus.
- Despite the emerging three centred strategy the Athalassa campus remains the largest and 'main campus' and has the capacity to house the University buildings identified to date for 10,000FTE
- The increased capacity on the Athalassa campus (calculated at 26% coverage - increased from 10%) has received encouragement from the Town Planning Department.
- With a development and investment focus on academic space, there will be limited public funds to construct further student residences. The numbers of student residences shown have therefore been limited to 1563 beds.
- A policy of stimulating private sector residential provision of all types in appropriate areas along the transport corridor between the three centres would have many benefits to the integration of the sites, the frequency of transport connections, the commercial sustainability of the service, and reductions in parking need on the site. The Town Planning Department have given encouragement to such a strategy.

OTHER CAMPUSES

- In the short term the Latsia Campus has become an essential and useful third teaching location and has proved to have some flexibility. It is however, fairly remote and operationally expensive. The University should progressively reduce its role and actively plan an exit from the site.
- Temporary specialist teaching facilities (eg Engineering) have become dispersed. The University should consider suspending growth until appropriate facilities are available. Ideally these should be the permanent facilities on the Athalassa Campus.

MASTERPLAN REVIEW



5.00 MASTERPLAN REVIEW - EXECUTIVE SUMMARY

- The Athalassa Campus is to be the main campus within a three campus estate strategy.
- The Athalassa Campus should have the capacity to house 10,000 students and associated staff and research.
- The building coefficient of the Campus should be raised to 25-30% (from 10% in 1994).
- The University Masterplan is arranged in functional bands running parallel with the dominant geographic feature - a steep escarpment. A belvedere sits on the escarpment with the major public university buildings to the north and the faculties to the south. These buildings are closely grouped for pedestrian movement ease around the 'core' university.
- It is proposed that the northern edge of the university is intensified with housing blocks set above parking. The area to the south is also intensified with residential and research use.
- A number of plots in the southern area have no specific function yet identified. This includes the controlled zone. The functions for these areas can develop as the University develops.
- A second phase of infrastructure will be required. This will include a southern loop road and a linked second energy centre.
- When the controlled zone is available the southern loop road can be extended and if necessary a third energy centre linked in.
- The University needs to develop a green transport plan. The parking on the Athalassa campus needs to be constrained within this plan.
- The University strives to be a leader in Cyprus in terms of sustainability and environmentally friendly construction and operation.
This should be implemented in three ways:-
 - Improved Building Construction
 - Improved Building operation
 - Use of renewable energy sources.

6.0 DEVELOPMENT OF THE ATHALASSA CAMPUS

6.01 Original Planned Phasing

In the development of the Masterplan for the Athalassa Campus the work was planned in phases. In the initial 1994 Masterplan which had a size of 4300 FTE students, Phase 1 was to be complete in 2000 and Phase 2 in 2003. In the last Development Plan (2004-2015) Phase 2 was planned to be in place for a student body of 8000 FTE by 2015

The current Development Plan suggests that the second stage of development could be completed by 2020.

The proposal approved by the Council of Ministers refers to a 'First Stage of Development'. This 'First Stage' is itself divided into two major phases (phase 1a and 1b):

Phase 1 includes construction of the following: -
1a:

- Infrastructure (Phase 1)
- Facilities Management and Stores Buildings
- Common Teaching Facilities (1)
- Faculty of Pure and Applied Sciences (Excluding Biology)
- Students Residences (Phase IA)
- Administration Building
- Social support facilities (Restaurant, Faculty Club, Students Union, Commercial Centre – Phase 1)

1b:

- Sports Facilities (Phase 1)
- Faculty of Economics and Management
- Common Teaching Facilities (2) and Arts Core
- Learning Resources Centre (Library, Computer Centre, Audio-visual labs – Phase 1)
- Faculty of Engineering (Phase 1) this has been brought forward in the stages of development from 2a to 1b)
- Common Teaching (3) and Sciences Core
- Department of Biology
- Students Residences (Phase IB)

Phase 2:

- Sports Facilities (Phase 2)
- Infrastructure (Phase 2)
- Faculty of Letters
- Faculty of Humanities
- Faculty of Social Sciences and Education
- Common Teaching Facilities (4)

- Faculty of Law
- Faculty of Engineering (Phase 2)
- Students Residences (Phase 2a and 2b)
- Cultural Centre
- Faculty of Medicine , both Pre-clinical and Clinical (Pending approval by government)

6.02 Progress to Date

The programme to date has been repeatedly extended principally due to the increasing University size, budgetary, and consequential resource constraints. For the 2020 programme to be achieved adequate project management and administrative resource and a guaranteed investment budget will be required.

Whilst the rate of student growth and faculty appointment has been fast, the construction of the permanent University campus is considerably behind the programme originally envisaged. The consequent shortage of space has constrained the academic and research ambitions of the University and created significant challenges to its efficient administration.

The building programme of stages 1 and 2 overlap in response to accommodation needs – Phase 1 ends around 2013 and both phases are programmed for completion by 2020.

6.03 The Current Position

Phase 1a is now almost complete:

- Infrastructure, Phase 1a -complete.
- Facilities Management Units, Stores and Workshop Buildings - complete.
- Faculty of Pure and Applied Sciences and Common Teaching Facilities (1) - complete.
- Student Residences Phase 1a -complete.
- Administration Building - complete
- The Social Support facilities are under construction and will be complete in 2009.

Phase 1b is currently in progress:

- The outdoor Sports Facilities are now fully utilised and the indoor Sports Hall has just opened.
- The Faculty of Economics and Business together with second phase of Common Teaching is under construction.
- The Learning Resource Centre has completed design and is ready to go to tender.
- The initial Brief for the Faculty of Engineering, is nearly complete. Approval from the Government has been received and the University is moving forward with the production and issue of competition documents.
- A brief for The Department of Biology, the Common Teaching

3 and Sciences Core has been issued in draft. Approval by Government for this brief has also been received.

- Phase IB Housing brief issued in draft.

Draft schedules of space standards have been issued for some of the remaining phase two faculties. This includes: -

- Faculty of Letters
- Faculty of Humanities and Social Sciences
- Department of Education
- Faculty of Law
- Faculty of Medicine (Pending approval by government)

The detailed brief for the Faculty of Fine Arts has yet to be drafted.

The briefs have been drafted for departmental areas relating to an 8,000 FTE Campus. A possible shape for a 10,000FTE University has been projected and the increased area for each department and for shared spaces has been calculated.

6.04 Planned Future Development

The current development programme (Phase 1 and 2) seeks, through controlled development, to allow the identified faculties to be accommodated on the site by 2020. (Some facilities, possibly one of the Arts Faculties or the post graduate Arts facilities may remain on the Academia Campus.) The table on the following page shows the buildings identified as being required for 10,000 FTE and indicates proposed site start and completion dates. (A more detailed programme ordered by occupation dates is included in Appendix A).

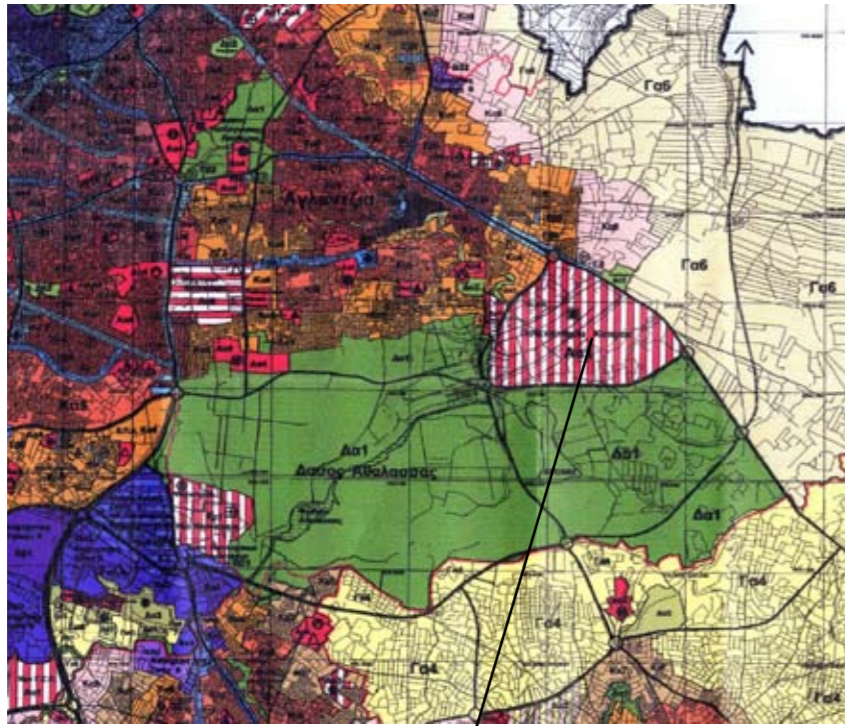
Whilst this programme shows a regular programme of building works on the Athalassa Campus it does not reflect any form of budgetary limit (see section 7.02). The programme is also ambitious in its assumptions of what might be deliverable. The works from 2006-2020 are shown as proceeding substantially more quickly than has been achieved in the last 5 years.



No.	Building No.	Faculties, Depts, Centres & Infrastructure	Year		
			Constr Completi on	Expecte d Comple tion	Expected Start Constr
COMPLETED PROJECTS					
1		External Works & Services			
	1.1	Enabling works	1998		
	1.2	Infrastructure - Phase 1	2001		
	1.3	External Services	2001		
	1.4	Drainage & Sewage Treatment Plant			
	STP 01/2	Sewage Treatment Plant	2001		
2		Parking			
	PRK 02	Open Air Parking (325 spaces)	325	2001	
	PRK 03	Open Air Parking (142 spaces)	142	2001	
3		Maintenance & Service Facilities			
	STP 04	Chemical and garden store		2002	
	SBD 01/2	External areas service buildings			
	SBD 04	Central Stores			
	SBD 05	Facilities Management Unit			
	SBD 03	Workshops			
	ENC 01	Energy Centre		2002	
		Central Plant			
		Oil Tanks			
		Pump Room			
	SPF 03	EAC Electricity Primary Substation		2002	
4		Campus Site Office			
	CSO 01	Campus Site Office, later CDO		2003	
5.1		Faculty of Pure & Applied Sciences - Phase 1			
	FST 01	Mathematics & Statistics & Computer Sc.		2003	
	FST 02	Physics & Chemistry & Biology		2004	
5.2		Central Academic Resources - Phase 1			
	CTF 01	Common Teaching 1		2003	
6		Residential Accommodation - Phase A			
	SRA 00-14	1a Housing - 208 rms (incl. external works)		2003-4	
7		Central Support Facilities			
		Administration			
	ADM 01	University House (incl. external works)		2005	
		Service Road (Part 1)			
8		Bus Stops			
		Bus Stops (2 on North loop & 1 at NE entrance)		2005	
9.1		Sports Facilities - Buildings & Fields - Phase 1			
	SPF 02	Changing facilities & Control Points		2006	
	SPF 08-15&20	Outdoor Sports Fields			
		Linear Park			
	PRK 05	Sports Parking Open Air PRK (124 spaces)	124	2007	
	SPF 01	Indoor Sports Hall		2008	
		Overfly bridge			
PROJECTS UNDER CONSTRUCTION					
10		Faculty of Pure & Applied Sciences - Phase 2			
	FST 02	EXT Science & Temporary Biology		2009	
11.1		Faculty of Economics & Management			
	FEB 01	Public & Business Administration		2010	
	FEB 02	Economics			
11.2		Central Academic Resources - Phase 2		2010	
	CTF 02	Common Teaching 2			
12		Central Support Facilities			
		Social Facilities Centre		2010	
	SFC 00	Central Square & External Works			

No.	Building No.	Faculties, Depts, Centres & Infrastructure	Year		
			Constr Completi on	Expecte d Comple tion	Expected Start Constr
FUTURE PROJECTS					
13		Learning Resource Centre			
	LRC 01	LRC			2009
14		Shadings - Belvedere & Pedestrian routes			2009
15		Parking			2010
	PRK 04	Sports Parking (Multi-Storey 320 spaces)	620		
	PRK 20	South West area parking Multi Storey	750		
		South West Infrastructure extension			
16		Faculty of Engineering			2011
	ENG 01	Engineering: Phase 1 (Engineering)			
	ENC 02	Energy Centre 2 (Shell)			2011
	PRK	Parking under ENG 01	100		
		Linking Infrastructure for 2nd Energy Centre			
	ENC 02	Energy Centre 2 (Fit out)			2012
		2nd Lake (Heat sink)			
17.1		Faculty of Pure & Applied Sciences			
	FST 03	Biology: Phase 1			2011
	FST 03	Biology: Phase 2			2015
17.2		Central Academic Resources - Phase 3			2011
	CTF 03	Common Teaching 3			
18		Faculty of Pure & Applied Sc. - Refurbishment			2015
		Science except Biology - Refurbishment			
19		Residential Accommodation - Phase 1B			2012
		Plot 17 Southern Area			
	SRB	1b Housing 380 rms			
		Southern Infrastructure Extension (West)			
	PRK	1B Parking (surface under trees)	220		
20		Faculty of Medicine			2014
	MMB 01	Pre-clinical medicine			
		Clinical Medicine - Off Campus			
21		Cultural Square			2011
22.1	LTR 01	Faculty of Letters			2012
22.2	HUM 01	Faculty of Humanities			2012
		Turkish Studies			
		Foreign Languages & Literature			
23.1		Central Academic Resources			2014
	CTF 04	Common Teaching 4			
23.2	SCE 01	Faculty of Social Sciences & Education			2014
		Social & Political Sciences			
		Education			
		Language Centre			
23.3		Faculty of Law			2014
	LAW 01	Law			
24		Residential Accommodation - Phases 3 & 4			
		North Western and North Boundary			
	SRC	2a Housing 390 rms			2012
	SRD	2b Housing 390rms			2016
	SRE	2c Housing - 195 rooms			2018
25		Parking			
		North Western and North Boundary			
	PRK 06	Perimeter PRK decked (440 spaces)	440		2012
	PRK 09	Perimeter PRK decked (220 spaces)	220		2012
	PRK 10	Perimeter PRK decked (320 spaces)	320		2012
	PRK 11	Perimeter PRK decked (700 spaces)	700		2016
	PRK 12	Perimeter PRK decked (520 spaces)	520		2018
26		Central Support Facilities			
	CLC 01	Cultural Centre			2015
	CLC 02				
	PRK	Parking under CLC 01 (2 basements)	430		

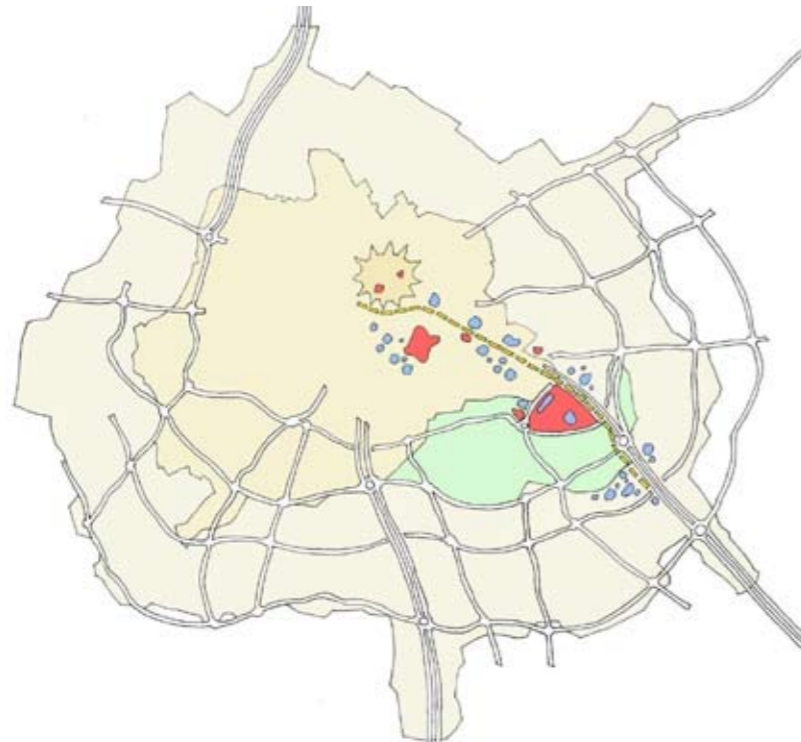
No.	Building No.	Faculties, Depts, Centres & Infrastructure	Year		
			Constr Completi on	Expecte d Comple tion	Expected Start Constr
27		Sports Facilities - Phase 2			2015
		Stadium, Fields & Swimming Pool			
	SPF 04	Stadium			
	SPF 05	Athletics stadium seating			
	SPF 06	Football seating & Changing facilities			
	SPF 07&16-19	Outdoor sports fields			
	SPF 21	Outdoor Swimming pool			
28		Faculty of Engineering - Phase 2			2016
	ENG 02	Architecture or Extension of Engineering			
29		Innovation Centre / Research Units Centre			
	INV 01	Innovation Centre			2017
	RU 03	Southern Area Research Unit No 3			2017
	RU 04	Southern Area Research Unit No 4			tbc
	RU 05	Southern Area Research Unit No 5			tbc
	RU 06	Southern Area Research Unit No 6			tbc
	RU 07	Southern Area Research Unit No 7			tbc
	RU 08	Southern Area Research Unit No 8			tbc
	RU 16	Southern Area Research Unit No 16			tbc
		Southern Infrastructure Extension (East)			tbc
		3rd Energy Centre			tbc
30		Future Electricity Sub-stations			tbc
31		Extension of Storage			2010
	SBD 06	Extension of storage			
32		Expansion of Faculty of Sciences			
	FST 05	Maths (or) Computer Sciences Building			2019
	FST 01	Refurbishment to accommodate Natural Sciences			2021
33		Expansion of Faculty of Engineering			2020
	ENG 03	Extension of Engineering			
34		Expansion of Faculty of Economics and Management			
	FEB 03	Extension of FEB 01 and 02			2018
35		Common Teaching			
	CTF 05	Common Teaching 5			2018
		Faculty of Fine Arts			
	FFA 01	Faculty of Fine Arts Building			2017
36	ADM 02	Administration Extension			2016
	ADM 01	Administration Refurbishment			2016
36		Civil Defence Shelters / Basements			tbc



The Athalassa Campus in relation to the Athalassa Forest.



Potential site areas for applied and collaborative research



Possible long term relationships of the University Campuses to a city wide road structure and the Athalassa Forest

6.05 Longer Term Development and Site Capacity Issues

The Athalassa Campus represents a unique resource in the context of the wider plans for the future growth of Nicosia. It sits to the North and East of the extensive, and protected, Athalassa Forest which mediates between the expanding existing city and the temporary UN Buffer Zone.

Whilst the political status quo remains, the University will remain at the edge of the city. However, were the political situation to change (as anticipated in the foundation of the University), then the context of the Athalassa site would change radically.

The city of Nicosia would expand around it, and the Athalassa Forest (and the Universities contribution to its quality [section 8.01.01] would increase enormously in importance as a civic asset. Given the accessibility of the University Campus from the national road network, as well as that of Nicosia, the University Campus would become a hugely valuable real-estate asset.

In order to succeed, the core academic area of the University needs to remain fairly dense to minimise walking distances, encourage interaction and promote vitality. Conversely, the University needs to set aside quite substantial areas of land, in close proximity to the teaching areas, to allow applied and collaborative research for the wider knowledge economy to flourish. The formation of knowledge clusters and synergistic networks is the lesson of Harvard, Yale, Stanford, Oxford, Cambridge, and all other world class research Universities.

Whilst the specific content of these zones cannot be predicted, their generic purpose can; and the current dialogue with the nearby Cyprus Institute is a very positive move in this direction.

The hypotheses of this Masterplan review following the high-level assessment of all the major issues is that the site can take a higher density of development than currently permitted in the local plan. It is therefore recommended that the University should develop a case to the statutory planning authority to raise this from 20% to around 30% coverage overall including some landmark tall buildings.

Other potential projects in currently available site		
Central Zone FD (MMB-02)		7,000
Central Zone FD (CT-04E)		7,000
Central Zone FD (SPF-01E)		4,000
Southern Area Plot 16		6,100
SUB TOTAL		24,100
TOTAL DEVELOPED AREA M²	110,116	299,318 172%
SITE AREA	942,000	942,000
% COVERAGE	12%	32%
Other potential projects in currently unavailable site		
University Hostel & conference centre		8,000
Phase 3a residences		15,120
Phase 3b residences		42,000
Southern Area Plot 10		6,500
Southern Area Plot 11		9,600
Southern Area Plot 12		0
Southern Area Plot 13		6,700
Southern Area Plot 14		2,100
Southern Area Plot 15		13,700
SUB TOTAL		103,720
TOTAL DEVELOPED AREA M²		403,038
SITE AREA		1,300,000
% COVERAGE		31%

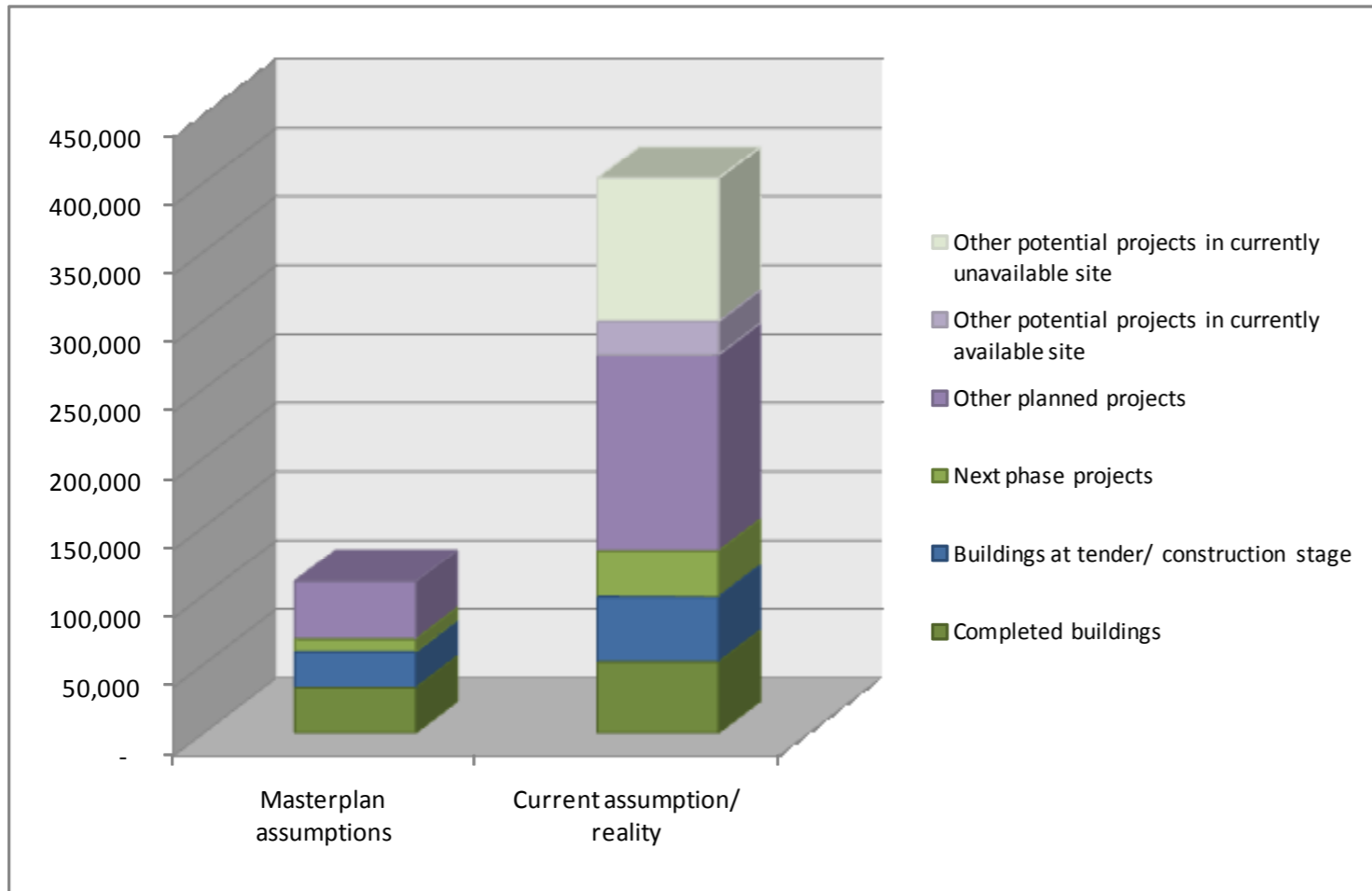
The whole site potential of the Athalassa campus as sites become available is calculated in the table on the left.

The areas titled 'Southern Area Plots' are currently assumed to have an applied or collaborative research use, but they could be any University function with a primarily stand alone use. This could include further residential developments or they could accommodate a further growth in student numbers.

If Faculties are located in the 'Southern Area Plots' they will be fairly remote and it is advised that they do not contain departmental expansion but new departments who do not need to be within easy walking distance of the central university facilities.

A 30% site building coefficient is achievable. The proposed increase in density would permit a fourfold increase in potential development from the 1994 Masterplan.

The planned development in 1994 was estimated to be 100,000m². The currently available site can accommodate 300,000m² of development. The whole site capacity is approximately 400,000m². The total University Site is approximately 1,300,000m² including the area of the buffer zone which is approximately 358,000m².



7.00 DEVELOPMENT CONSTRAINTS

7.01 Operational / Administrative Capacity

The University of Cyprus established the Campus Development Office in order to administer the development of the new campus and assist in the management of the existing estate. The CDO has been assisted throughout the entire development of the project (since 1992) by YRM, a british consultancy firm. The Masterplan for the Athalassa Campus, which has been approved by the Council of Ministers, has been used as the basis of this development.

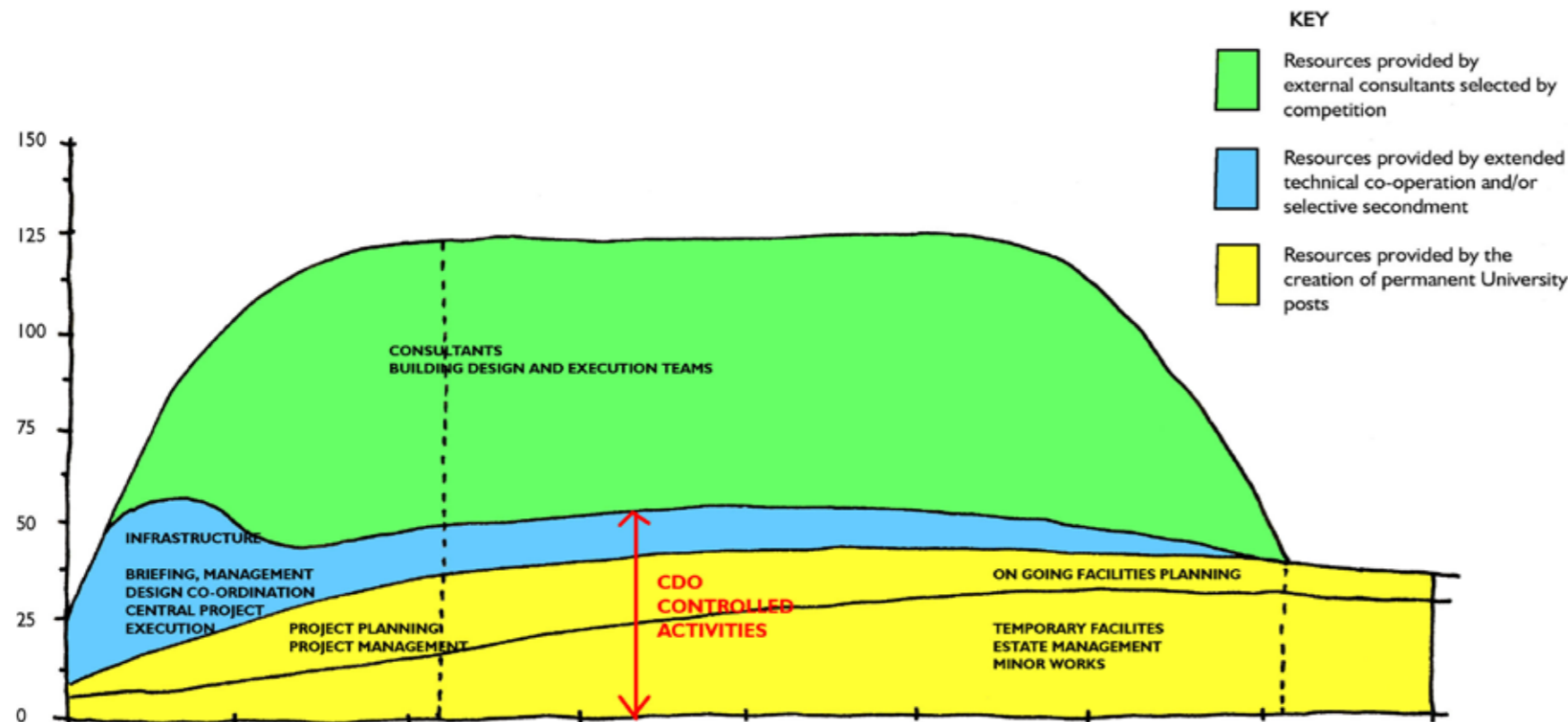
The graph below shows how CDO's work (shown in yellow) is supplemented by other resources for functions and competencies that are unlikely to form part of the long-term skill set required by the University 'in-house' (blue). CDO controlled activities are also supplemented by externally sourced delivery teams for individual projects – selected through competition for all the major buildings (green). As Cyprus is integrated into the EU, these are likely to include international as well as local specialist skills.

A version of this graph was included in the original (1994) implementation planning document – the dates and estimated numbers have been updated to reflect the current planned position.

Some of the 'blue' and the 'green' tracks are currently being undertaken by the CDO, even though the intention is for CDO to minimise its involvement in these areas and concentrate on a their planning, supervisory and maintenance roles.

CDO is divided into 3 main sections :-

1. **The Planning and Design Division** is responsible for the planning, programming and promotion of projects. It is also responsible for the projects designed in house. Additionally the division is in charge of co-ordination of the briefing process, the management of the competitions to external architects and project teams and some works relating to specifications for project fit out.
2. **The Construction and Project Execution Division** is responsible for the Client-side Project Management of projects on site. (This includes the Client's Clerks of Works role). The division also safeguards through cost effective management, the budget, timing, safety and quality control of projects under construction up to handing over.
3. **The Operations and Maintenance Division** runs the estates issues on the existing campuses. This group has been very stretched over the last 3 years due to the proliferation of temporary accommodation. Increasingly the other two groups have been used to help with the design and specification and construction of temporary facilities outside the Athalassa Campus.



7.02 Financial / Budget Limits

Managing the expenditure of allocated money.

The loan conditions from the European Investment Bank and European Development Bank required the expenditure of €143.5m (Cy£ 84 million) by the year 2006. There has been a significant under-spend. As currently structured the Campus Development Office can only administer a maximum design and construction budget of around €15.4m (Cy£ 9 million) per year. This restriction is exaggerated by spending on temporary facilities, especially where these are ineffectively controlled, as this requires a resource far in excess of that suggested by their capital value.

A plan to deliver projects of aggregate €35m value per year is unlikely to be achieved without major strengthening of the CDO management team, the use of adequately skilled and resourced private sector consultants and contractors, and a more focussed set of CDO responsibilities.

Achieving Continual Development

Development progress on the new campus has been slower than planned. In order that the CDO can respond effectively, a 3-5 year budgetary plan needs to be confirmed to enable the plans to continue and for any yearly under-spend to be managed. Design fees will also need to be committed on a regular basis to ensure the design work and construction on site continues as planned. Uncertain or contingent budgets will not enable this to occur.

Continuing Fast Growth

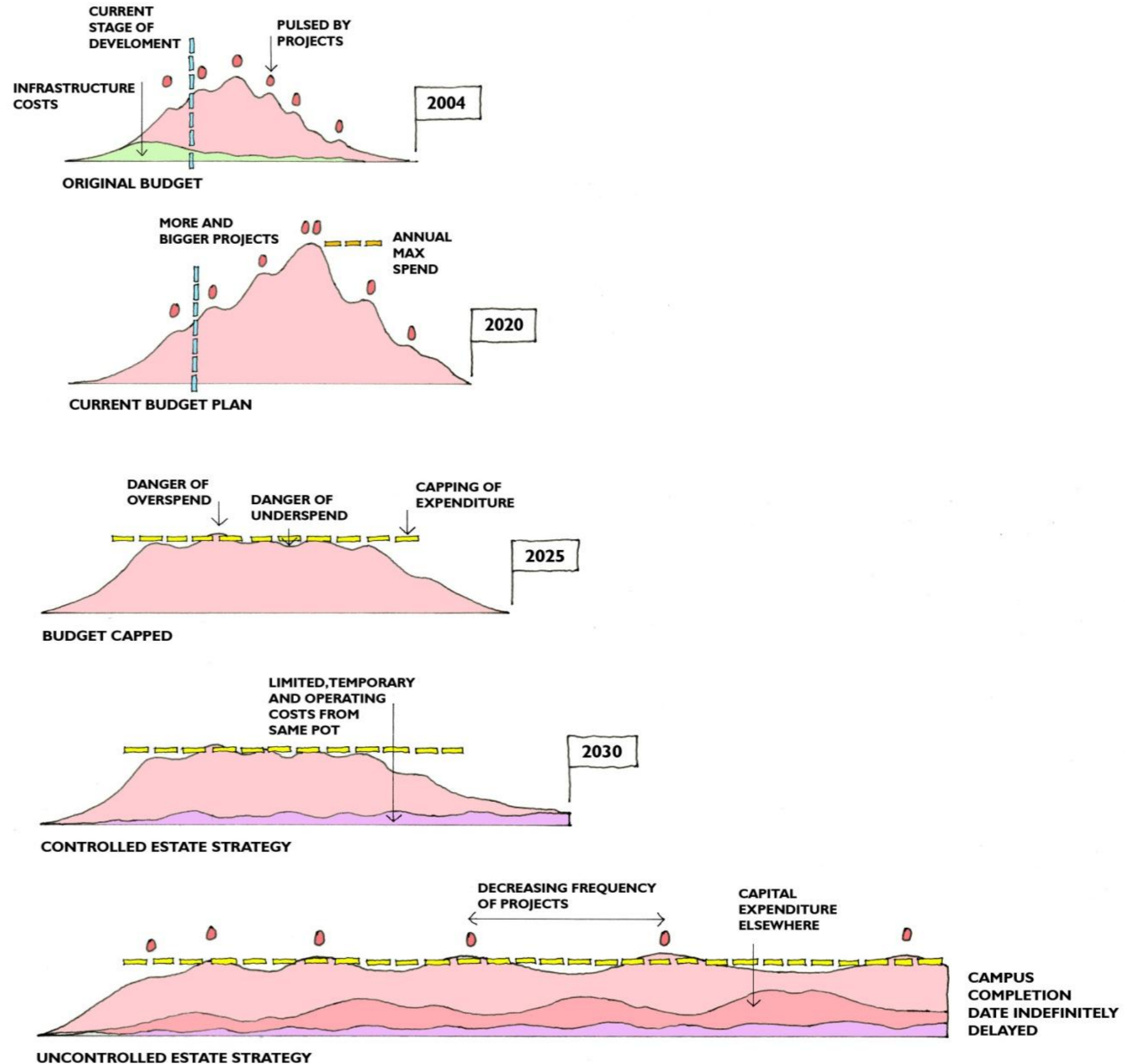
The University has grown rapidly since 2000 from 2500 FTE to 5500 FTE whilst simultaneously expanding the number of faculties and departments. The development plan has not kept pace with this fast growth and this has caused the current pressures on the temporary and the permanent estate.

For the CDO to manage the Estate, the planned rate of growth in all departments needs to be fully understood. If the current rate of growth is to be sustained with the current capital budgets there will be pressure for some areas of the estate to develop at the expense of others. Uncontrolled expenditure on the non permanent development will mean the programme and budgets for the Athalassa Campus will become seriously eroded.

7.03 Managing Departmental Accommodation Needs

As Departments grow, so do their space requirements. The space requirements of research, in particular, can be quite large. The estate strategy of the University should not limit the University's ambition, however it does need to understand the University's priorities so that it can meet changing needs and allocate spaces and capital and operational costs.

The Technical Services Department should seek to ensure that the spaces that are available are utilised as fully and most appropriately as possible. To this end the University could consider introducing 'Space Charging' as a management tool. Using this tool would mean that all spaces were allocated to departments or the relevant service (e.g. the LRC) or support sections (e.g. Central administration). The allocation of funds from departmental budgets to estates costs is then in proportion to the amount of space allocated



7.04 Construction Capacity

There are currently significant skills shortages in the construction industry in Cyprus. These are particularly acute in areas of financial control and project management. It was and continues to be essential for the University to market the project opportunities to the major contractors and consultants in Cyprus to ensure that they can mobilise, in advance, the resources necessary through recruitment, training or association with others.

Due to the size and complexity of the projects being realised at the University, it has become essential to strengthen the pre-qualification conditions at all stages of the realisation of projects, thus ensuring that prospective participants (both consultants and contractors) can deliver all resources for the high quality output desired.

The process of the campus development has made a positive contribution to the enhancement of experience, competitiveness and the transfer of knowledge within the Cyprus construction sector.

7.05 Procurement Constraints

The CDO has been using and/or investigating a number of alternative procurement techniques to reduce project risk. Initially the projects were procured through the route of open architectural competitions. The advantages and disadvantages of this procurement route include: -

Advantages

- Potentially a wide range of exciting and high quality design ideas.
- Inclusive – everyone is given an opportunity to participate.
- Established and well-understood procurement route.
- In accordance with the University's philosophy for transparency and innovation.
- Approved preliminary design to hand.

Disadvantages

- Length of time to set up. (The minimum additional time required for a competition is 6 months.)
- Site Experience. The larger local architectural practices have not generally taken part in the competitions to date. This has meant that practices with lesser experience have been generally appointed, adding to the administrative burden on the Campus Development Office. In some cases this has meant that CDO has had to provide a 'shadow' consultant team, substantially diverting both manpower and budget.
- Technical Experience. The smaller design practices often do not have the technical delivery expertise required in the design, development and execution of the more complex technical building.

PRE-QUALIFICATION

With the accession of Cyprus to the EU, the procedures of the Official Journal of the European Union (OJEU) must be followed. These allow the Pre Qualification of consultants, ensuring that the practices selected to participate in competitions have the relevant site and technical experience.

This system was used for the Faculty of Economics and Management and it is proposed that all future projects have a similar pre-qualification requirement. The promotion of the architectural competition for the faculty of Engineering, will be the first to occur within the new European context.

DIRECT SELECTION

Consideration has also been given to procurement routes that might not contain a design competition. This route might be appropriate for the more technical buildings where the design and the brief are best developed in consultation with the University and the users.

The OJEU procedures can give greater flexibility to building promoters than have previously existed for the procurement of public buildings in Cyprus. Specifically they enable the client to select teams on pre-set criteria immediately after the pre-qualification process. This method encourages larger practices to participate as there is less cost and therefore less risk exposure. Design team selection via this method could accelerate the building procurement by up to a year.

USE OF ALTERNATIVE PROCUREMENT

Use of alternative procurement strategies should be limited so that smaller or less complex buildings can still be procured via the open design competition route. The University would therefore continue to show its commitment to open competition, the development of young architectural practice and its promotion of new ideas.

DIRECT APPOINTMENT THROUGH DONORS

Alternative procurement methods are currently being used for the Learning Resource Centre, facilitated through a large private donation. In this case the architectural services of a 'named' architect are being paid for by the donor with the local consultant team being employed by the University.

BOT (Build Operate Transfer)

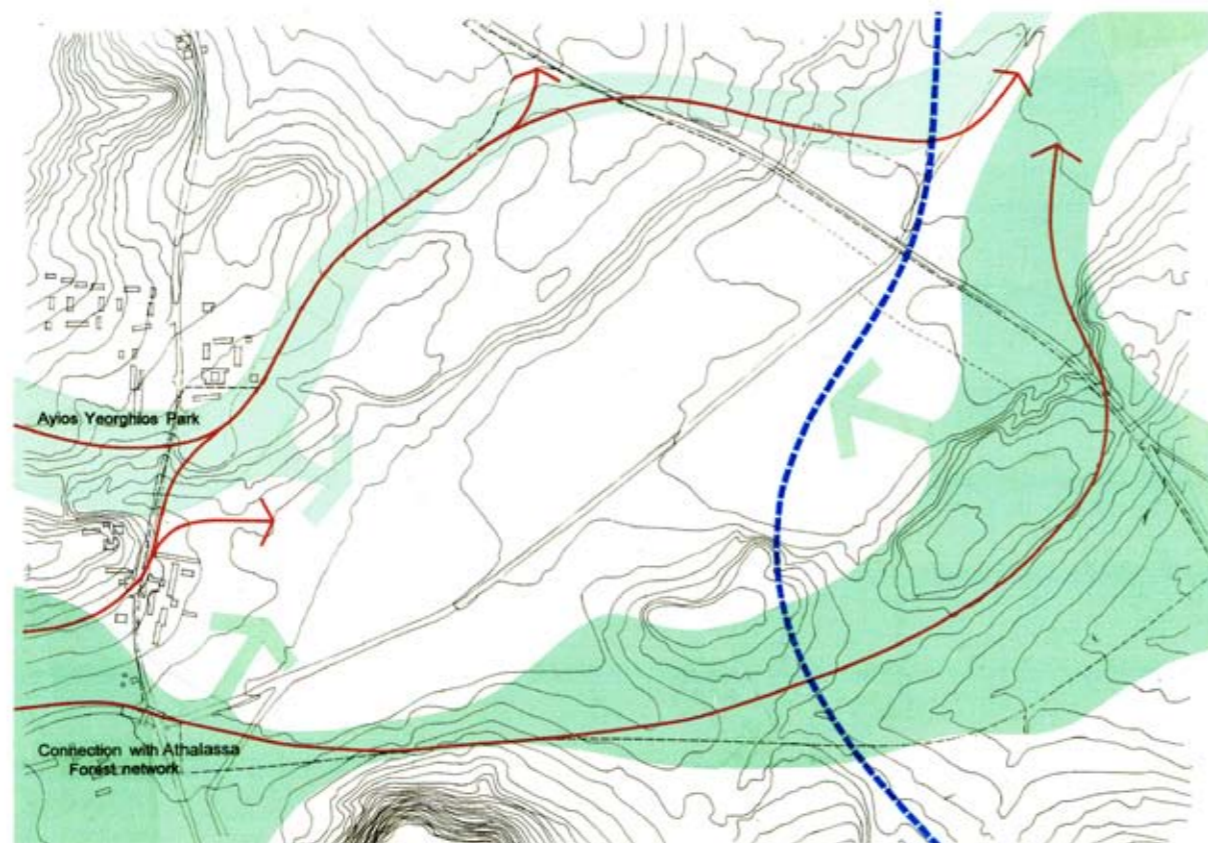
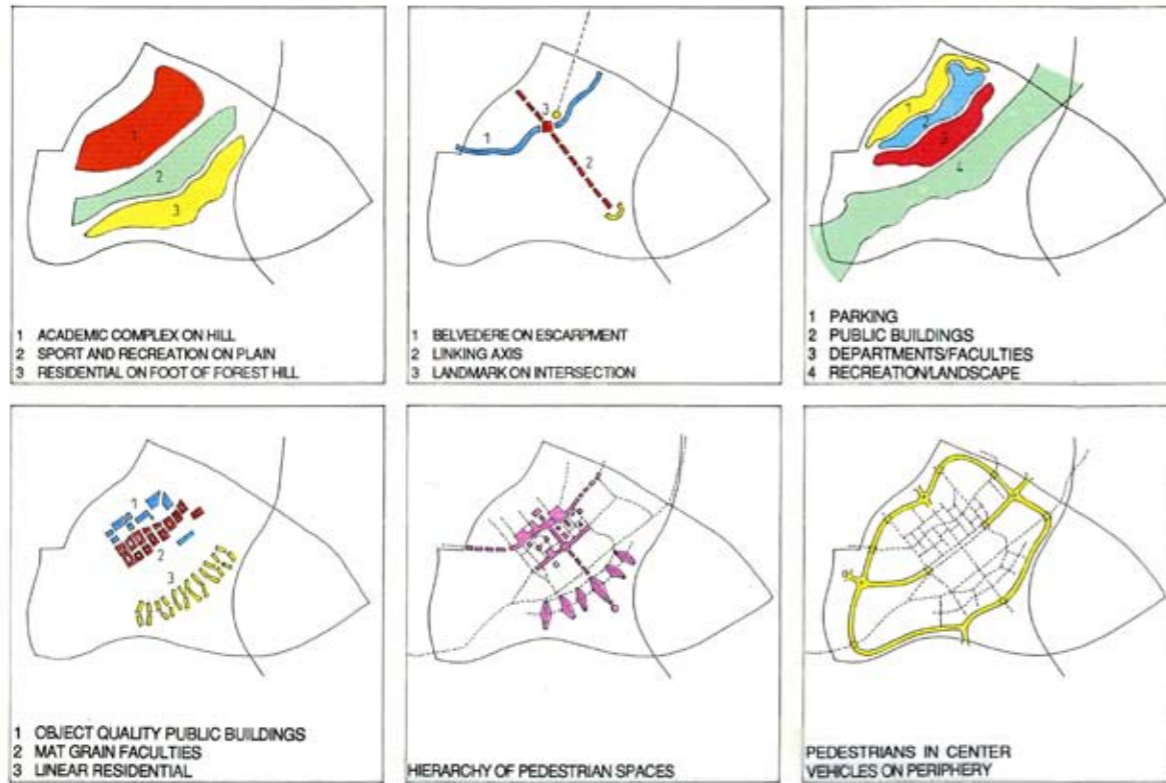
Under this contractual arrangement a development team could be selected using the European Union pre-qualification selection process followed by perhaps a limited design competition or a competitive interview. The designers would be employed by the developer and the design would be developed adding the developers own briefing requirements to the Universities brief, within a design and build contract.

On completion, the developer would operate the building gaining income from the University as tenants. The developer would operate the building for a fixed period (set out by the University and usually based on the period of time taken for the developers initial investment to be repaid). After the agreed fixed operational period the building's ownership would be transferred back to the University. The physical condition of the building at the time of transfer would be agreed in advance in the initial bidding process.

A typical arrangement may be an operational period of 25 years and an agreed further 25 year building life at transfer. This type of arrangement is usually restricted to building types where a firm income can be predicted for an extended period. For example in the UK Universities have developed many student housing schemes using a BOT arrangement. For these to be successful the University needs to agree student rental with the developer and guarantee the developer a number of students requiring residence every year.

A market testing study has recently been undertaken by Price Waterhouse Coopers for the University to test private sector appetite for constructing residences under this method. Interest has been very limited largely as a consequence of the degree of subsidy by the University to existing rental levels for on-campus accommodation.

The rental currently does not even cover operational costs far less depreciation or a return on the original capital employed. This position is not sustainable, and will create a fundamental impediment to private sector involvement in future campus capital development.



8.00 ATHALASSA MASTERPLANNING PRINCIPLES

8.01 The 1994 Masterplan

The planning principles established in the Masterplan Report of 1994 have been followed throughout the implementation of the Campus development. The infrastructure and 'core' of the Campus Plan is established and the programme of physical expansion is well underway.

The original zonal principles, now tested in practice, have proved to be effective as a control framework for creating a robust Campus environment and character. The principles remain essentially valid though they have been developed further and strategies refined to respond to new issues that have been identified in the intervening period.

The 1994 principles are summarised as follows:

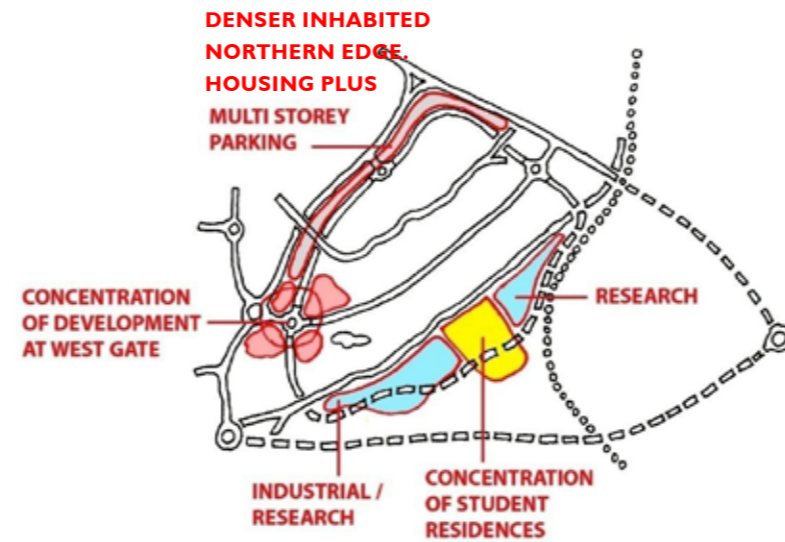
- A planning organisation that follows the natural diagonal site grain.
- Central development planned in three zones; core academic (including public and faculty buildings), sports and recreation, and ancillary activities (including residential).
- Public buildings and activities located on the plateau facing and visible from the city of Nicosia.
- The creation of a pedestrian 'Belvedere' along the escarpment forming the principal social realm of University life.
- The front doors of all the academic buildings, opening to the escarpment belvedere, forming the public and shared domain of the University.
- A tight grain for the academic buildings forming a hierarchy of linked spaces from public, through semi-public to private.
- A traffic organisation based on a peripheral circuit for service needs, a central zone free of traffic, and spur roads providing vehicular access to academic buildings. Car parking on the site perimeter, accessed from the two entrances and the Northern Loop road.
- The organisation of utilities as a circuit, served from one or more combined heating and power plants.
- An inherent pattern of growth, developing outwards from the campus core.

Of particular importance is the intention to extend the environmental quality of the Athalassa Forest through and beyond the University Campus, to form a large scale circumferential green lung to the South East of the city.

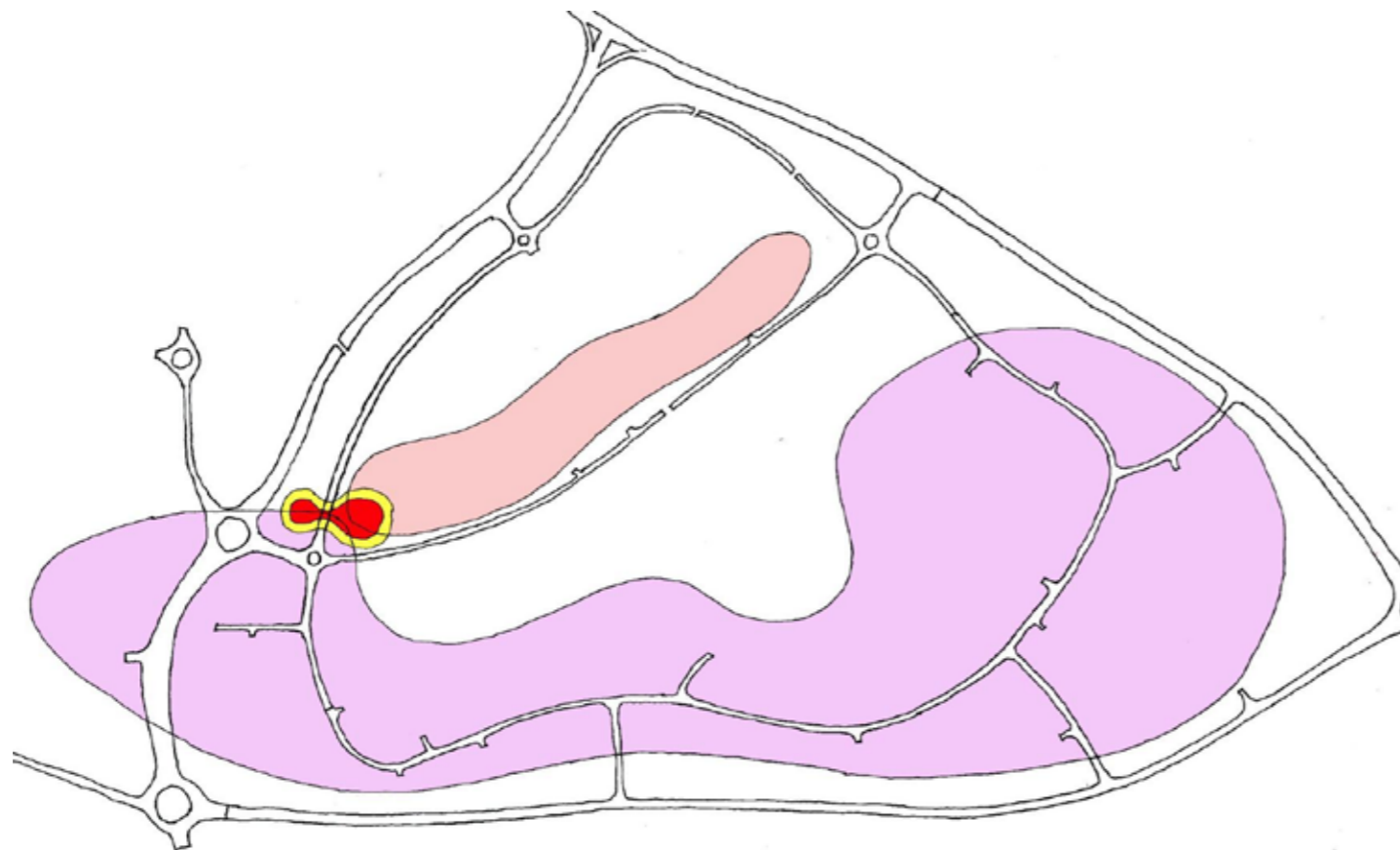
COMMITTED AREAS



INTENSIFICATION AREAS ?



IDEAS AND OPPORTUNITIES



The Southern Development Zone could link with a more intensely developed faculty zone at the Western Gateway.

8.02 Pressures on the existing masterplan

The pressures that were identified on the 1994 Athalassa masterplan through the masterplan review process include:-

1. Increasing links with the city
Since 1994 the city has developed and expanded out to meet the campus. The northern edge of the campus therefore faces an increasingly developed residential zone, albeit across a major traffic artery. The form and function of University development on the northern and eastern edges should respond to this context and create links where possible.
2. Creating gateways
Gateways to the University and framed views out of the University could be created along the northern edge. A major western gateway could also be formed at the western roundabout to announce the University to visitors from the South.
3. Utilising the whole site
Areas of existing available land could beneficially be more densely developed. Areas of the site currently within the Green Zone should be integrated into the long term planning of the campus.
4. Increasing density
The Planning Authority have indicated they would be receptive to an increase in the density of development on the campus.
5. Increasing height
Some areas of the campus could sustain a taller development. In particular the residential elements on the central axis could add to the residential capacity of the campus if substantially higher.
6. Safeguarding future research space
A substantial proportion of the currently undeveloped area of the site should be safeguarded as a land bank for University linked research.
7. Increasing access by non car modes
Parking and traffic congestion is a major issue in Nicosia. It needs to be addressed with urgency by the University as the current 70-90% student car usage will necessitate very substantial investment in expensive structures. The traffic and transport strategy should be expanded with a Green Travel Plan as set out in Section 4 of Chapter 11.
8. Protecting the landscape setting
The various landscape settings need to be protected and expanded as set out in Chapter 9.
9. Promoting complimentary uses
The range of buildings on the campus and on the surrounding sites should be considered for the benefit of the University and the City.
10. Promoting a sustainable environment
The various concerns targeting to a sustainable campus environment are presented in Chapter 10. Principles for better utilisation of resources are also identified in Chapter 12.

8.03 Masterplan Development Strategies

8.03.1 Roads & Access

The Campus road layout and principle site entrances remain as envisaged in the 1994 Masterplan north of the Kaloyeros River, and the University is capable of considerable growth and expansion within these network constraints.

However, were the wider political situation to change it is envisaged that the extension of the Athalassa Forest Road to the Old Larnaca Road would be completed thereby creating a new defined southern Campus boundary.

This would allow the creation of an extended research area accessed from the new road. The southern extension of the Campus perimeter road could then be re-routed to provide direct vehicular access to a number of accessible plots for a range of purposes in close proximity to the core University.

This generic double loop with central service spine is a very strong diagrammatic framework for long term flexible future growth.

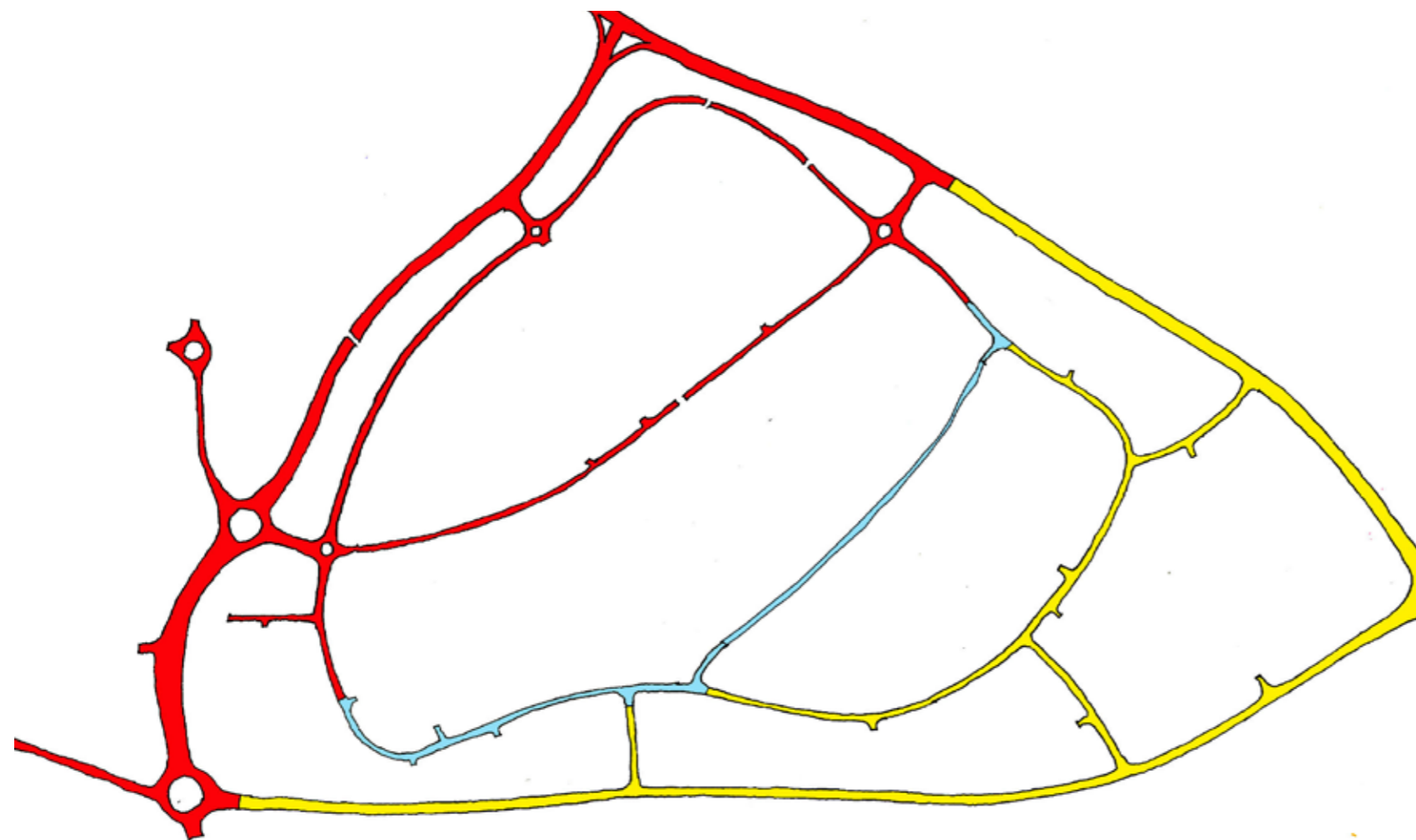
Before the controlled area becomes available the southern loop could be contained within the available site. This link would become predominantly a pedestrian/cycle way when the expansion loop is built.

8.03.2 The Forest

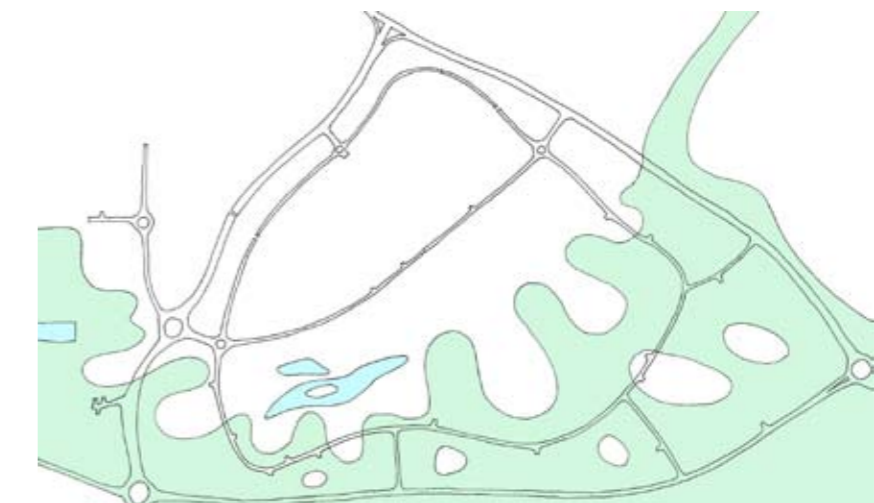
The 1994 Masterplan envisaged the expansion of the Athalassa Forest on to the University site. This has been largely implemented and the advance planting is now well established.

Part of the intent was to create a network of recreational footpaths, independent of the core, secure, University area linking the Ayios Yeorghios Park, eastward along the Kaloyeros River to create a circumferential linear park for an expanded SE Nicosia.

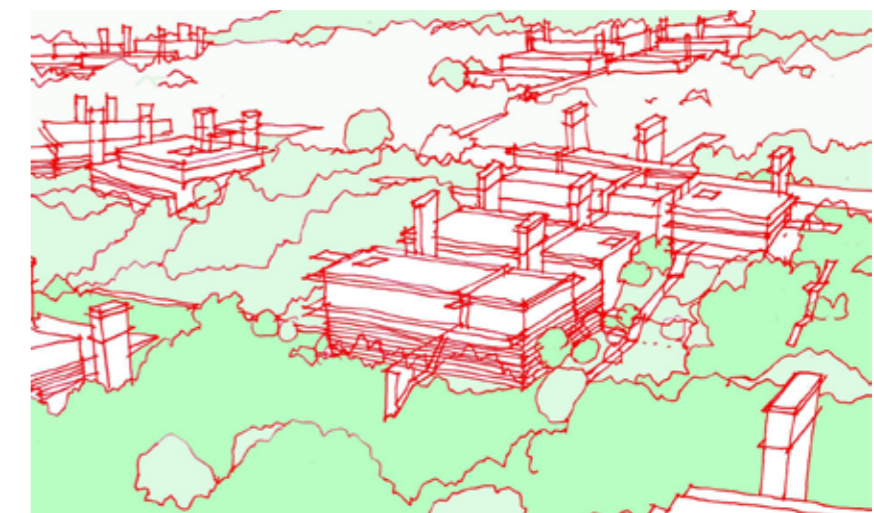
This remains the intent, and is not incompatible with intensified development for the University, including applied and collaborative research activities, which are envisaged as a set of 'clearings' within the continuous Athalassa Forest.



Road network existing (or under construction)- Red, Phase 2 proposed- Blue and Future proposed - Yellow.



The Athalassa Forest sweeps across the southern edge of of the campus



Research builds are envisaged as set in clearings in the forest



Pedestrian/cycle network existing (or under construction) and proposed



Existing shade structure on the belvedere



Example of photovoltaics above parking in the United States

8.03.3 Pedestrian Circulation & Cycleways

The proposed network of footpaths and cycleways is intended to fulfil three principle roles.

- To promote connectivity between the University and surrounding areas, segregated from vehicular traffic modes and to promote alternative travel modes to the Campus for those students and staff living locally. This will be essential if the modal shift objectives necessary for a Green Travel Plan are to be successfully delivered. The network should also link in to all possible public transport opportunities.
- To allow effective segregation of control for the essentially 'core' University network (red), from that which might encourage a more public use (blue).
- To promote the latter network as a publicly accessible extension of the Athalassa Forest onto the University site, also creating safe pedestrian links across major roads to provide a potentially substantial recreational and leisure resource, for the city as well as the University.

The relationships of the walkways, at many levels, and their links to the public open spaces is important to the feel and working of the campus. A series of incidents (small buildings, shade structures and landscape) are also proposed on the pedestrian network to enhance the experience of the campus and to facilitate wayfinding.



Illustrative plan of northern edge

8.03.4 Responding to pressure from the North.

The pressure of development on the northern edge is halted by the re-aligned Aglanjia-Geri road. However it is the desire of the University that the northern fringe does not turn it's back on the City.

In 1994 it was proposed that this northern fringe was landscaped parking. It is proposed that this remain but with the parking becoming multi-storeyed (or decked). Two or three storeys would only be partially visible from the road when the landscape fringe develops. The upper storey of the parking might be roofed/shaded by photo voltaics, providing a renewable power source.

This band of development might also be punctuated by taller towers. These would create gateways to the University and also be visible from a distance signalling the University. These residential towers would be raised above the parking and the noise and pollution of the re-aligned Aglanjia-Geri road.

8.03.4 Infrastructure Phasing

In the 1994 masterplan it was envisaged that the energy centre located to the east of the Campus would provide all the energy needs of the University (location 'A' in diagrams).

Principally as a consequence of the increased size of the buildings constructed to date, (as set out in section 3.07) and partially as a consequence of their lower environmental performance, the planned capacity is being taken up at a much faster rate.

Given that the volume of the building on the site necessary to serve all the long term and associated needs of a world class research University could entail a 300% increase of the originally planned development, there is clearly an imperative for a similar planned growth strategy for the site infrastructure.

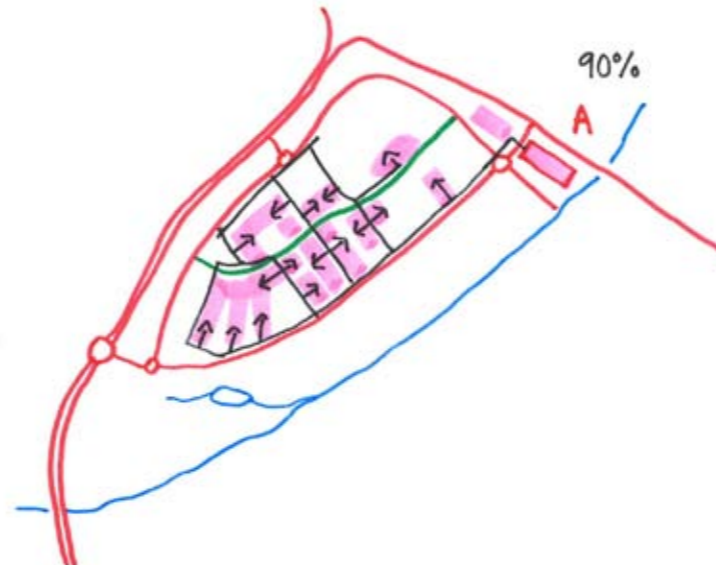
The diagrams opposite illustrate the principles of this strategy, the details of which are set out in chapter 10 of this report.

It is recommended that a substantial second energy centre be created (primarily to increase cooling capacity) in order to unlock capacity in the eastern centre to service future academic growth closest to it (location 'B' in diagrams).

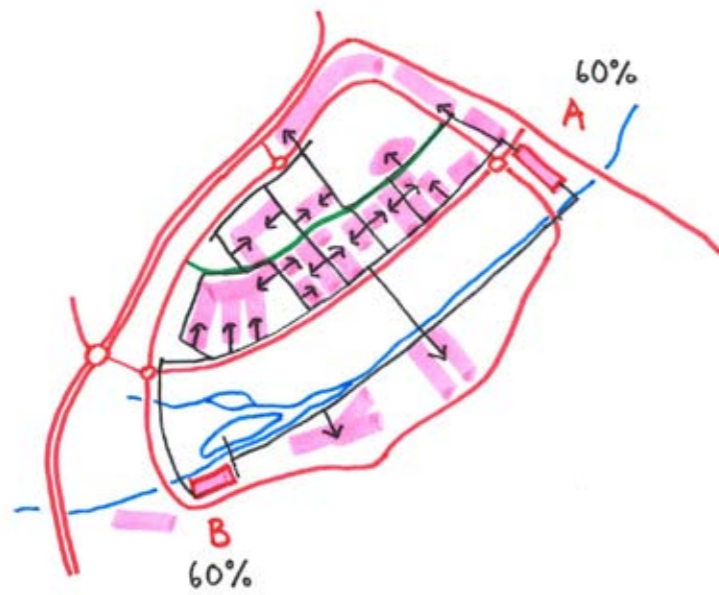
Energy centres 'A' and 'B' could service the current planned developments for 10,000FTE. If further development occurs in the controlled zone a third linked energy centre - 'C' could be developed.



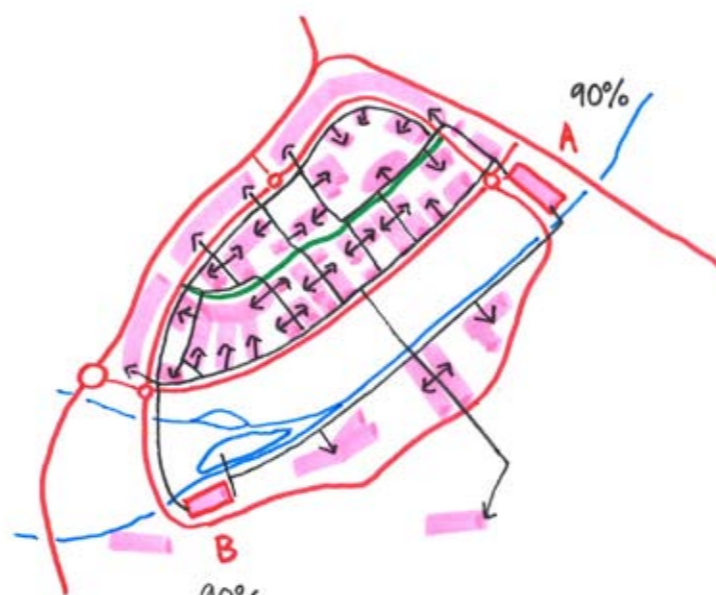
Current position: Energy Centre - 'A' at 30% utilisation



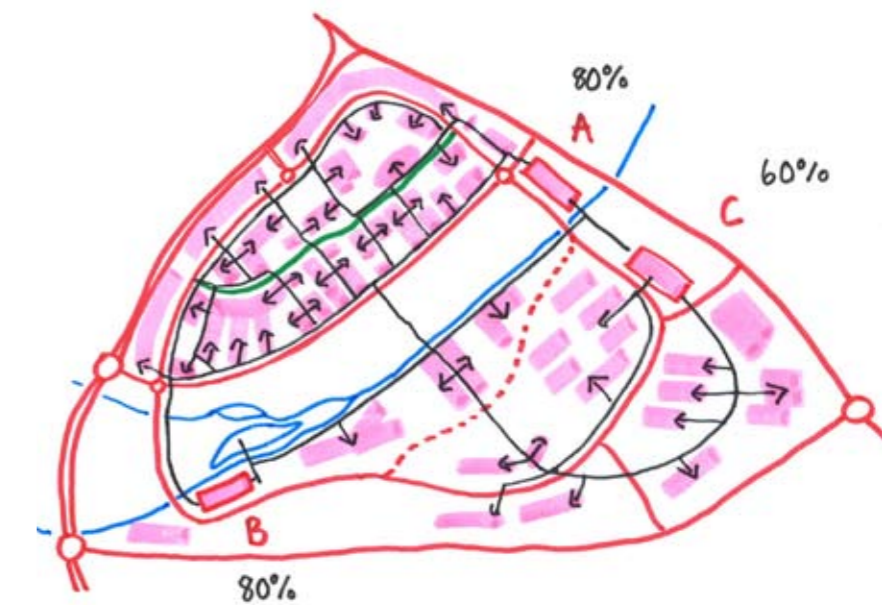
Energy Centre - 'A' (Possible high utilisation on completion of the LRC, Engineering and Biology)



Proposed second energy centre - 'B' (Utilising the second lake for cooling)



'A' and 'B' could support development west and south.



A third energy centre - 'C' could be built to service the southern section of the site if the research park is developed under the University's auspices.

8.04 Functional Strategies

The original 1994 masterplan was based on a simple zonal separation by function. Whilst somewhat coarse, this basic regime has proved an effective control tool to accommodate the shifting needs of the University over its first decade of development.

It is therefore recommended that a similarly broad (and therefore robust) planning strategy be continued.

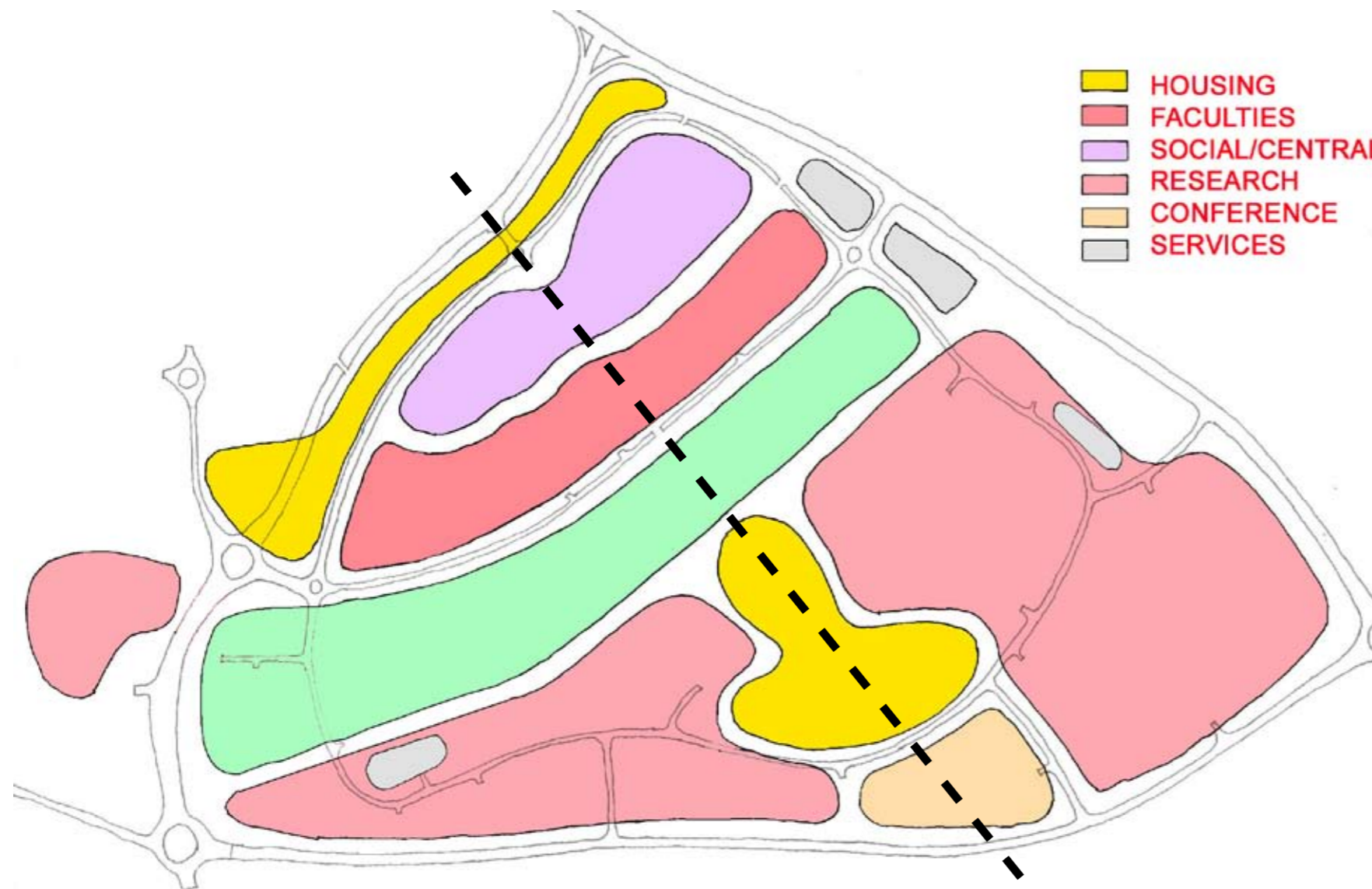
The principle changes recommended are :-

- the incorporation of a northern peripheral housing zone,
- the accentuation of the principle NW-SE pedestrian route in the centre of the campus,
- and the identification of the southern edge as an area for future applied and collaborative research activities.

It is also proposed that the central faculty area and the residential areas could be denser than originally envisaged taking advantage of the relaxation in the height parameters suggested by the town planning authority. The denser faculties area should continue to be enhanced with primary and secondary pedestrian routes and squares.

Alternative functions have been considered for the southern areas. The housing could be expanded. Faculties /Departments who need a more remote location could be accommodated or the area could be utilised for applied research as shown.

It is envisaged that the hotel/hostel and conference centre indicated would be for University use.



Developed zonal strategies 2008

8.04.1 Security and Functional Separation

The original masterplan assumed that access to the campus road network would not be restricted, and that security would be provided by a human presence outside buildings, and controls at building entrances.

The manner in which the campus has been used since opening, particularly by vehicle users, suggests a more restrictive policy will be required. This will need to be introduced over time as part of a parallel Green Transport plan.

It is proposed that access to the service road be controlled solely for that use, and access restrictions are introduced to parking areas for the core University. Strategies for the southern campus area will need to be safeguarded for future implementation.



Restricting central road to service access

8.04.2 The Core University

The core University area comprises the area within the northern loop road and southern service road with housing and recreational areas immediately beyond in both directions.

The belvedere, which is largely level, is the principle movement corridor within this zone, and with increasing shade protections, is relatively user friendly. The overall length of the belvedere is compatible with maximum effective walking distances between campus facilities.

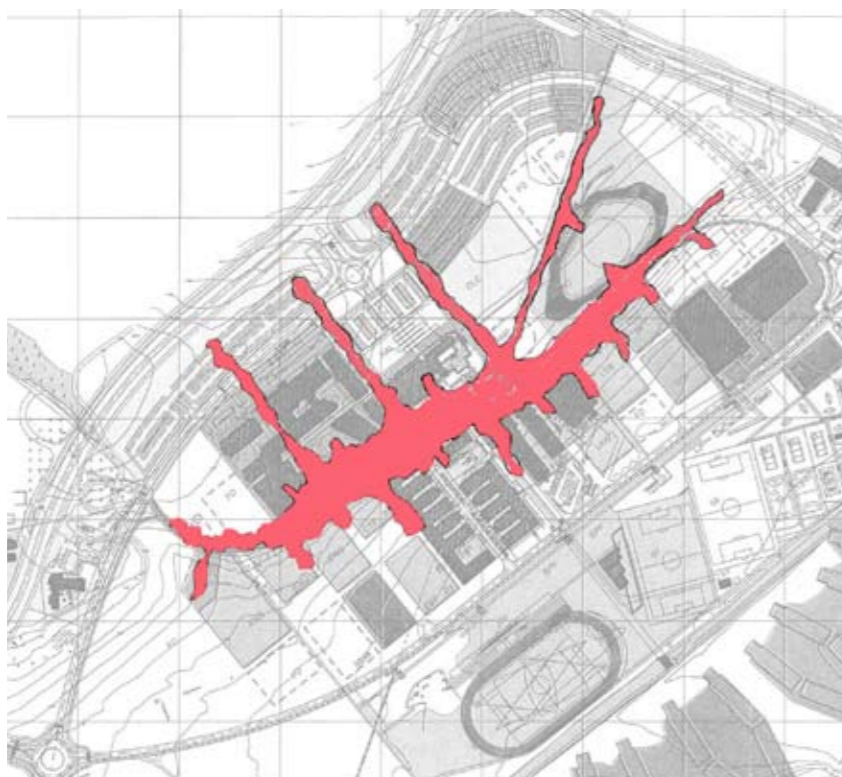
Movement perpendicular to the belvedere is much more challenging because of the contours, and effective pedestrian movement distances that are tolerable in the warmer months are therefore liable to be shorter.

8.04.3 Building Heights

It is proposed that the building heights reflect the contours of the site. With low buildings (predominantly sports facilities) on the river plains with buildings increasing in height being built up the northern and southern rims.

The current height restrictions along the belvedere (ground +2) are thought to remain appropriate. This allows the faculty buildings to rise up to 5 storeys from the base of the slope.

It is suggested that the residential towers could be taken substantially higher to exaggerate the bowl of the site.



Zone of intense activity within the core University.



SECTION VERTICAL X 10



TRUE SECTION

Contour illustration and possible development heights

8.04.4 Parking

There has been a very significant increase in the number of private cars on Campus from that envisaged in the 1994 masterplan report, which proposed 2000 parking spaces (1700 cars and 300 motorbikes). This parking is uncontrolled, both in numbers allowed on to the Campus and in location on Campus.

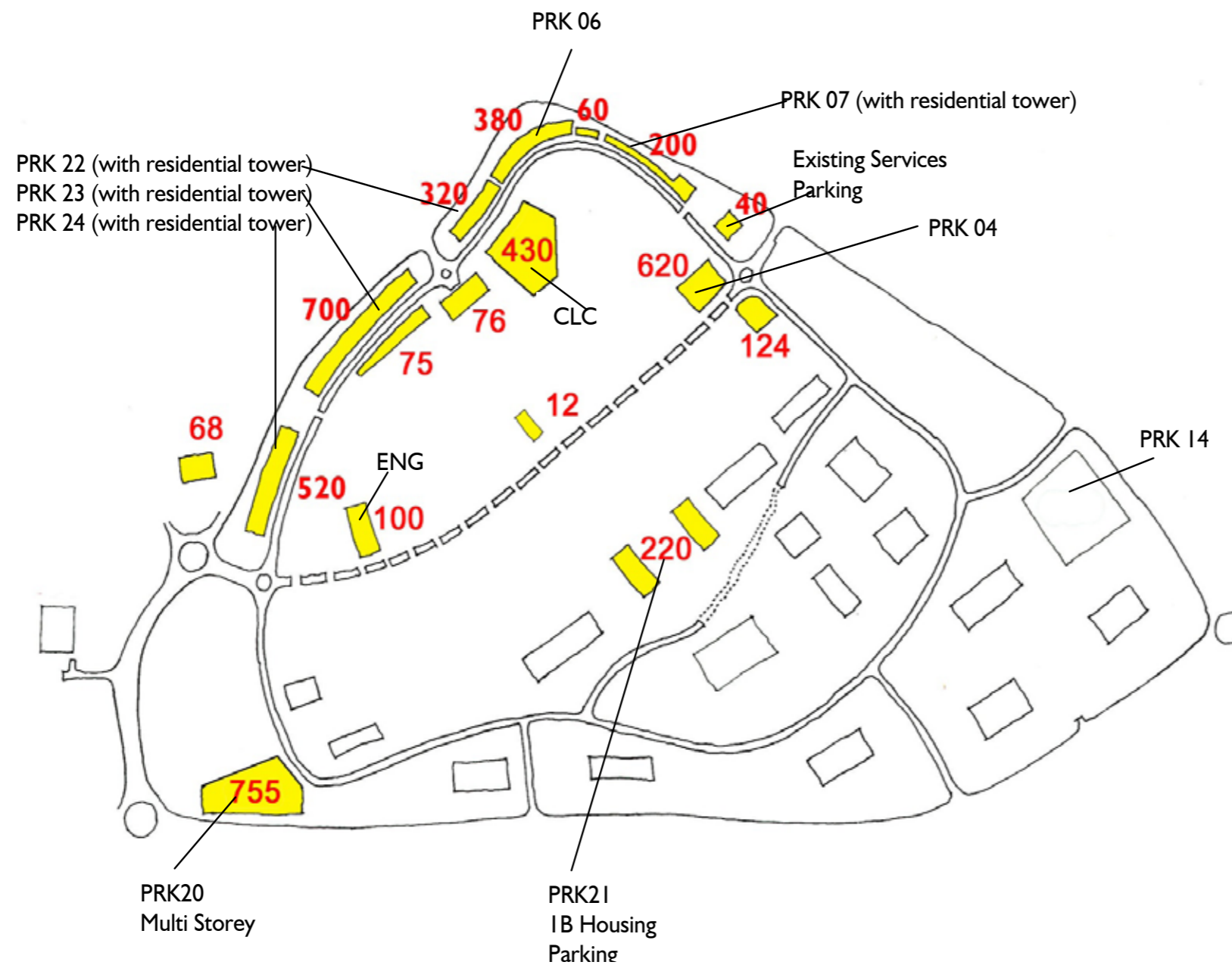
With the increasing density on the site to accommodate 10,000 FTE comes the requirement to also densify the parking.

An estimated 4,700 spaces would be required to service the Core University. It is proposed in the long term these are located in the following zones:-

- the entire northern perimeter adjacent the new road is converted to double level (+) parking.
- there is an (enlarged) multi-level structure next to the sports hall, that a three-storey parking structure is constructed close to the western principal entrance
- that underground parking is provided under the Cultural Centre and where possible under Engineering (this will be limited by the requirement of ground bearing structures).
- Surface level parking around the residential blocks.
- Future parking in the research park accounted for separately.

The parking limit would have a major impact on the access mode of students were the University to grow beyond 10,000 students.

(See also section II - Traffic and transport report)

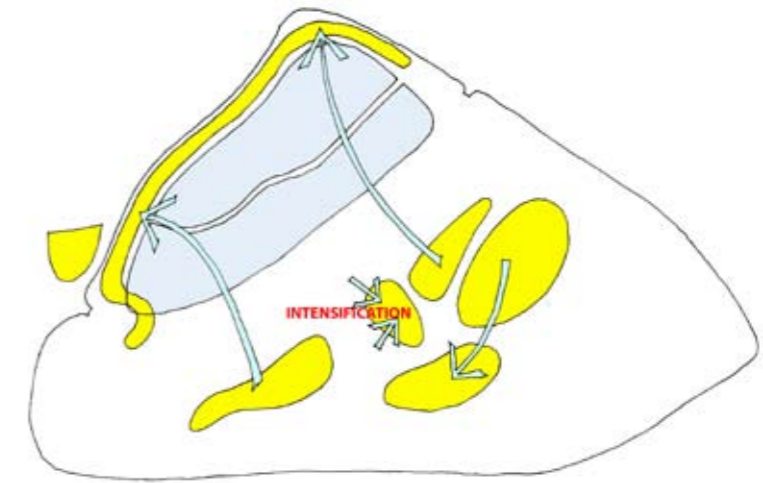


8.04.5 Housing

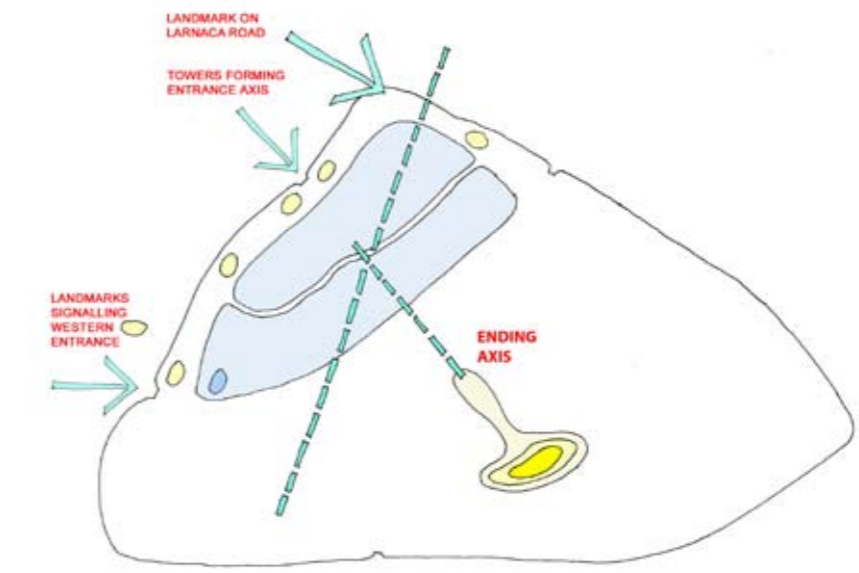
Only a limited amount of student housing has been constructed on the campus to date. During the masterplan review the YRM team were instructed not to increase the total number of residences proposed. (1563 units - originally calculated as equal to the number of academic student intake per year when the University was sized at 5200 FTE).

The masterplan review suggests that some housing could be located on the northern campus edge. This could be positioned above the parking in towers to frame views and create gateways.

It has been calculated that the northern residential zone plus a denser southern residential zone can accommodate the 1563 units.



Residential areas relocated



Residential blocks used to create and frame views

8.04.6 Research Development

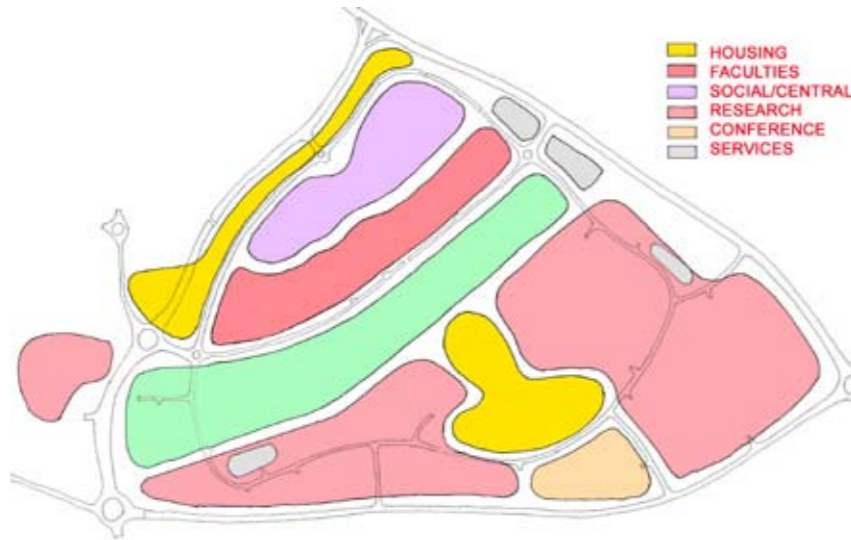
The forested area to the south of the campus has the greatest development potential. Buildings of various sizes and forms could be accommodated in a coordinated manner in clearings in the forest. These units could be part of the core University or linked research establishments who wish to be located near to the University. It is ideally situated to become the University's research park.

The applied research buildings would be on individual plots screened from each other by the trees of the Athalassa Forest. A variety of modes of tenure might be established.



Research Park parking under the buildings to reduce the impact on the forest.





Zoning on the 2008 Masterplan

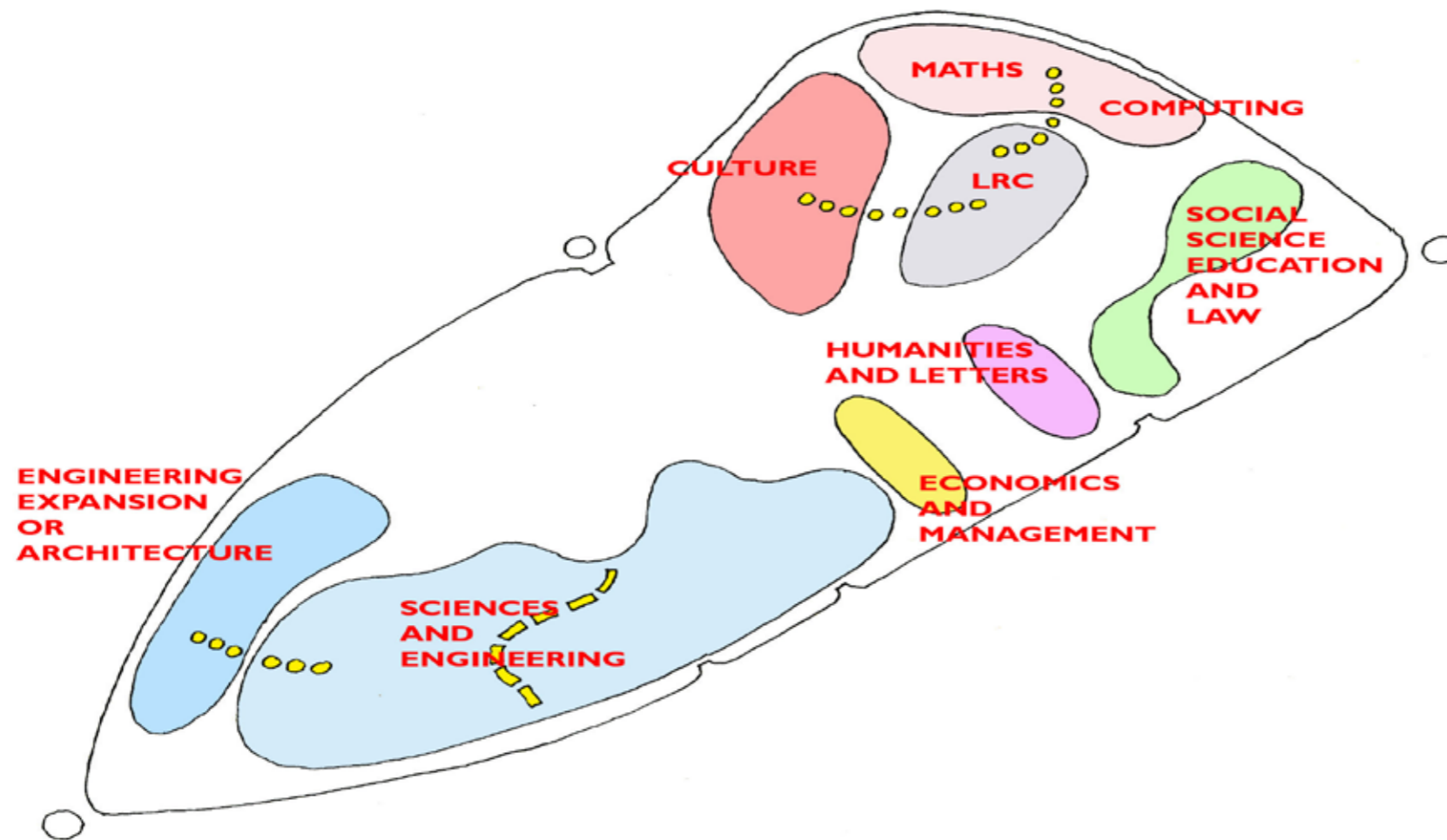
8.05 Zonal Strategies

8.051 Overall and Central Area Strategy

The diagram to the left indicates how the zonal strategy is developed in the 2008 Masterplan, in order to utilise the whole site more effectively.

In the core University area the plots required for each of the Faculties have been considered. Depending on how the University grows it is envisaged that the Sciences and Engineering Faculties will expand west - the exception to this might be that Maths and Commuter Sciences might need to relocate to release their existing building to the Natural Sciences. A possible re-location for them would be near the LRC. Economics and Management could expand south while the other Arts Faculties could expand east.

Depending on the Department of Architecture's final location and the make up of the Faculty of Fine Arts this could be located near to Architecture or adjacent to the Cultural Centre.

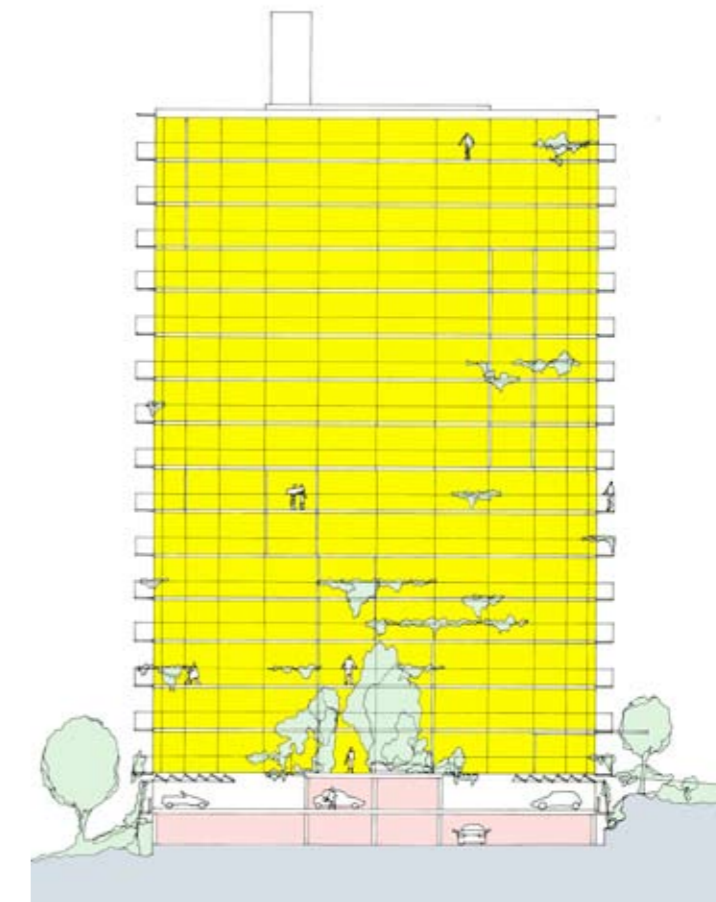


8.05.2 The Northern Edge

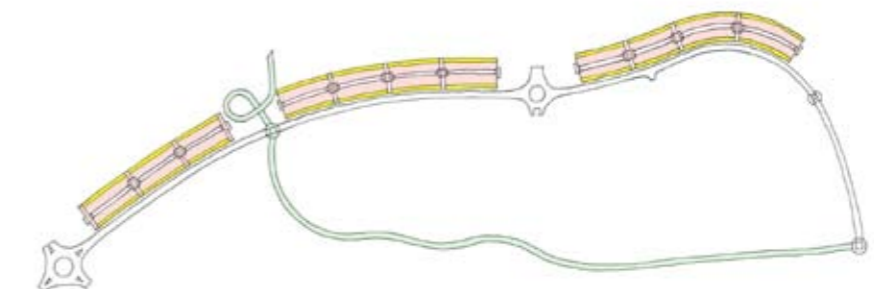
The 2008 Master Plan envisages an expansion of parking along the north-west campus boundary by increasing the surface footprint and by stacking an additional level of parking on top. A well landscaped fringe and the levels across the site would disguise the parking from the perimeter

Student residential accommodation, could be built above the decked parking creating focuses for varying views and raising the residences above the realigned Aglanjia-Geri road.

Consideration should be given to the utilisation of the space below the student residences to ensure that the ground level does not become hostile and detached from other ground level circulation.



Early sectional ideas for residential tower
Potential of parking strip





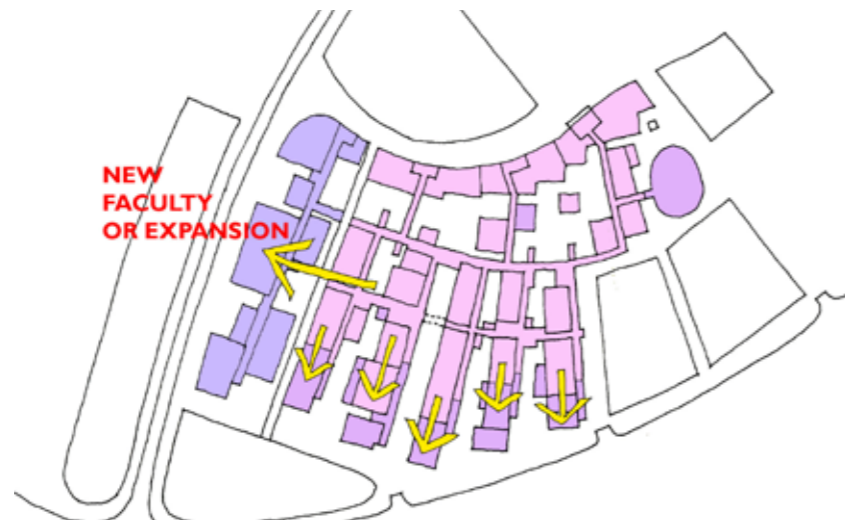
Testing the Site for the Faculty of Engineering, (Colors represent different departments)



Testing the Site for the Faculty of Engineering, Building Heights



Possible zoning



Two types of Expansion - each department or a new department

8.05.3 The Western Gateway

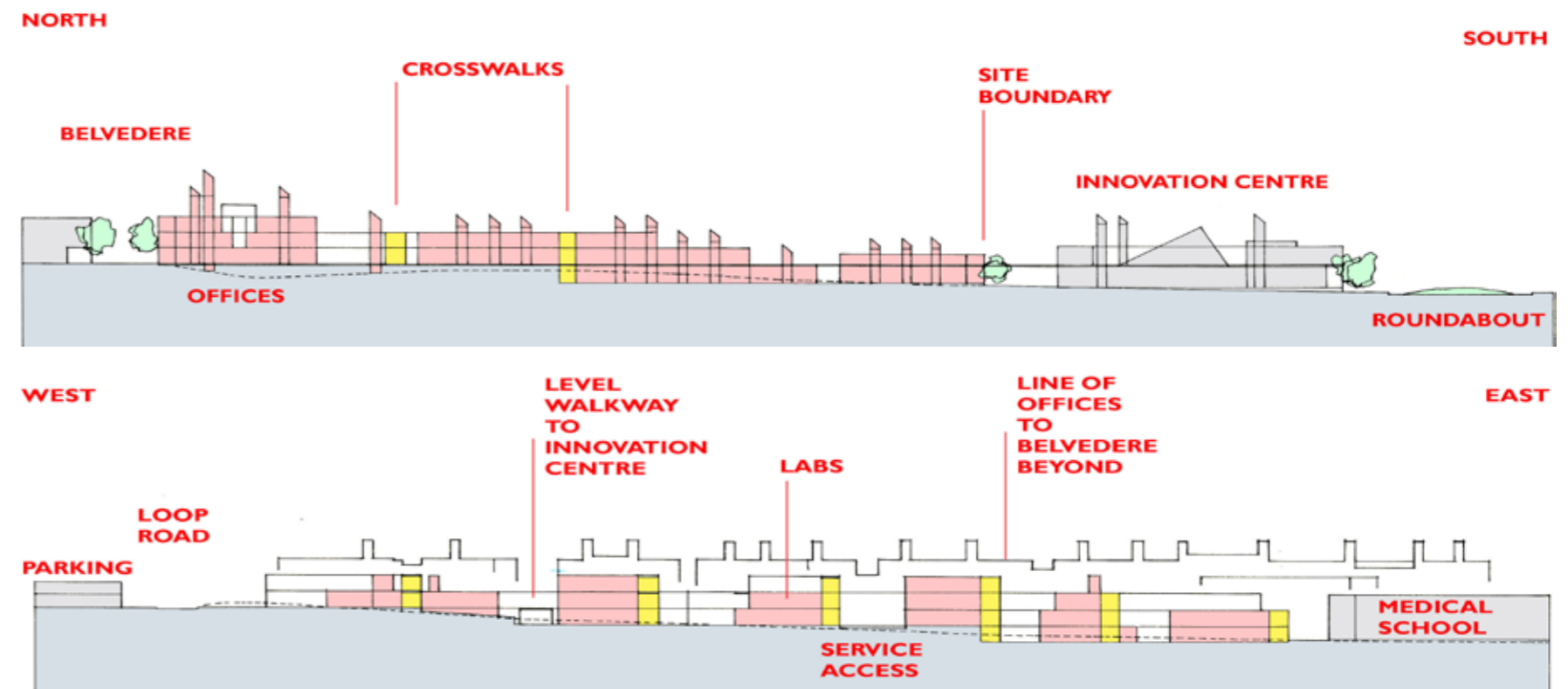
The first phases of academic accommodation in the central zone (uniform orientation of buildings, their widths, pedestrian routes between buildings, open courts and covered plazas) have established a natural 'grain' for the Campus development.

It is envisaged that this grain might vary in the future, as buildings of different use-types and plan-forms are designed for plots to the west and east of the central zone.

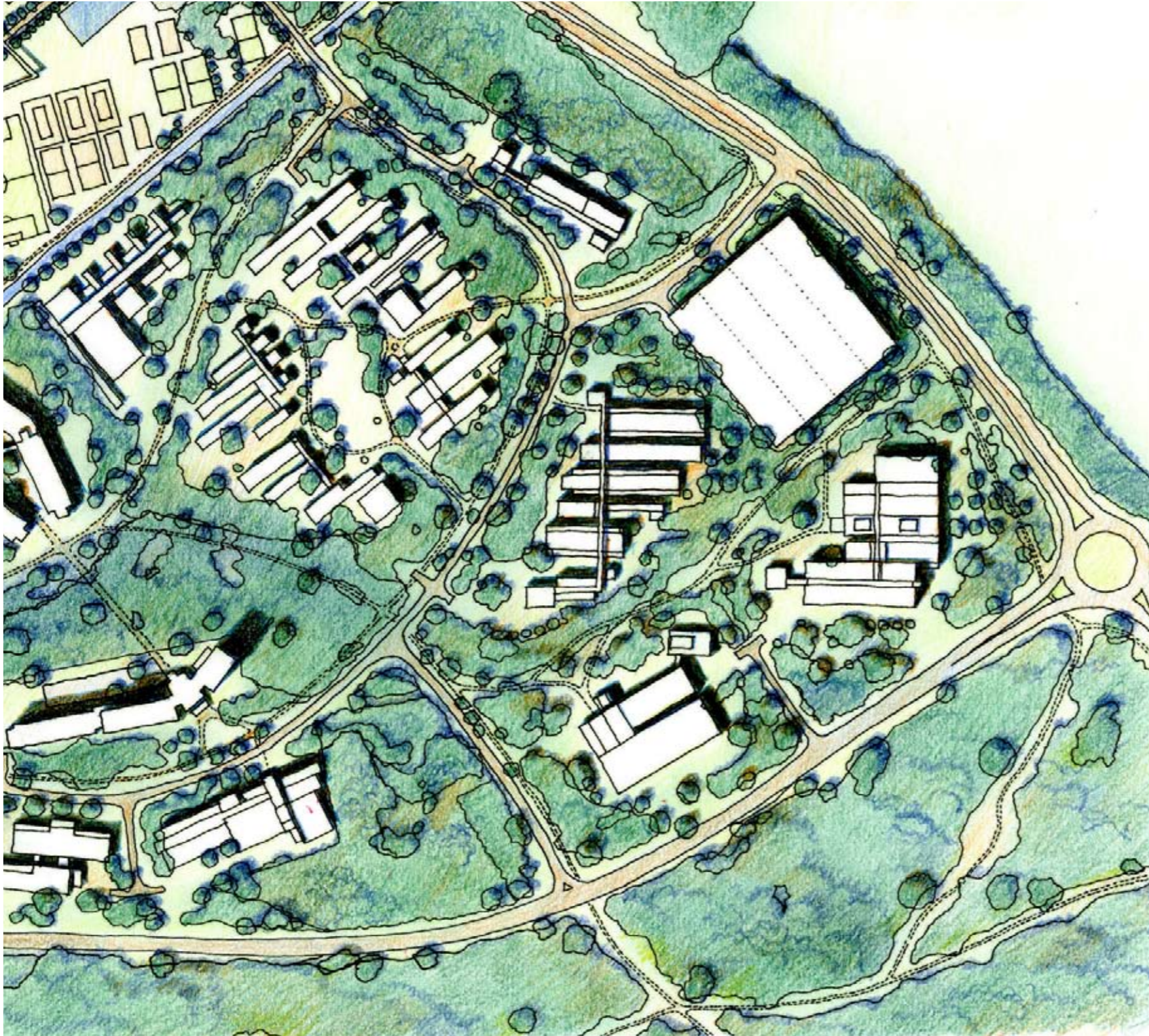
The Faculty of Engineering buildings will be more varied in character than the existing departmental buildings and extend over a larger footprint. The development as a whole might be used as a 'hinge' or pivot turning the Belvedere corner and allowing the established grain to continue again at right angles to the Belvedere, towards the western Campus boundary.

The sites around the western roundabout will be very prominent on arrival at the campus. Ideas for the content of this gateway include a "whole" University based research establishments such as an 'Innovation Centre'.

The diagrams shown on this page are not a design solution for the Faculty of Engineering, but were drawn to investigate brief fit and site issues. The site allocation has changed since the production of these drawings. It is proposed that the design of the Faculty of Engineering buildings be procured through a limited design competition with a shortlist drawn via the OJEU PQQ process.



The site for Engineering falls from both North to South and West to East



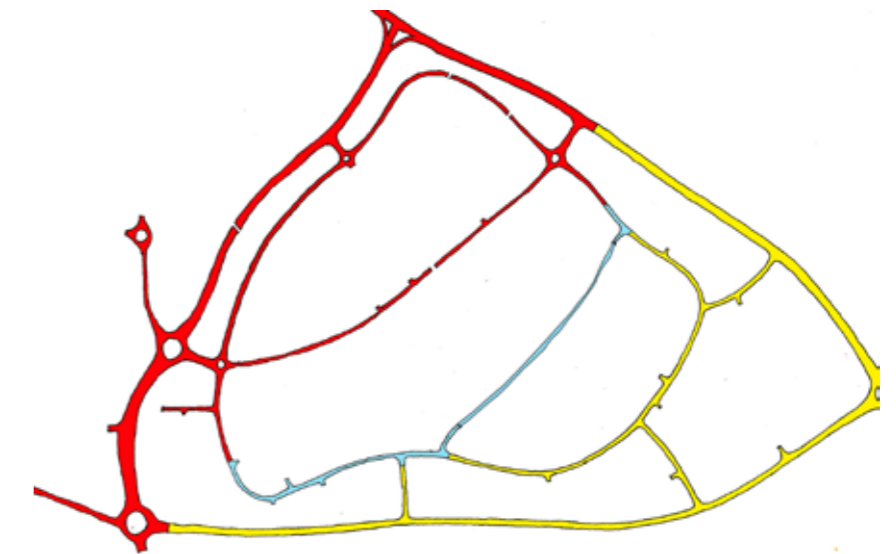
8.05.4 Development of the South and the South East Corner

Any development to the south of the river will necessitate the second phase of infrastructure (roads indicated in blue below). The first buildings that might be provided in the South are the South West corner multi-storey car park or the Phase IB central axis residential blocks.

If these projects are delayed the second energy centre will first be required to service the large new Arts Faculties on the east end of the central zone.

The Development of the South East corner needs to be considered in the short and long term. In the short term the south east corner sits in the green zone and development is currently impossible. The University however could usefully use the dips in the contours as part of it's long term spoil strategy. (If this is not possible some dips in the landscape around the central axis could be utilised).

In the long term the south east corner might become an integral part of the research park with road links to the rest of the city.







The Landscape area below the first common teaching block

9.00 LANDSCAPE REPORT

9.01 Introduction

This landscape report has been prepared as part of the review of the development of the Athalassa Campus of Cyprus University. It is intended as a commentary on the outcome of the implemented landscape at the site, so as to provide feedback to the construction of successive phases of the University. It evaluates the success of the phasing, landscape strategy, design character and structure as well as the relative success of planting types of the implemented landscape. It provides some remedial advice on areas where the planting has been less than successful and suggests further areas of work.

The report is in four main sections:

Section 9.03 gives an overview of the planning conditions which apply to the site and its surroundings and whether these have changed.

Section 9.04 gives a summary of the site's physical characteristics and how these have developed with the implementation of the first phases of the University.

Section 9.05 defines the landscape strategy and its framework of character areas, it describes how well these characters have been developed in the masterplan context.

Section 9.06 describes the landscape masterplan and the success of specific techniques, landscape features, types and planting. It also makes recommendations for remedial work which should be carried out.

Section 9.07 includes broad recommendations for the future development of phases outside the core area of the site, based on YRM's sketch for the Greater Campus Plan.



The Athalassa Campus



The North Entrance - through the administration building

9.02 Executive Summary

Novell Tullett is part of the design team for the development of the University at Athallasa Campus, Nicosia, Cyprus and has been asked to review the Masterplan produced for the University in August 1994, prior to development of the next phase of faculties within the site. This review has been carried out in conjunction with a site visit to assess the effect and extent of work implemented; the success and failures of the landscape completed and an evaluation of lessons learned, in order to benefit from the experience gained in implementing the initial work in the development of subsequent phases.

The review sets out the original tenets of the design and evaluates the implemented landscape against it. The following elements were sited in the masterplan and a brief evaluation of the implemented landscape follows:

- **Planning conditions:** these have not formally changed since the original masterplan, and the presumption is to continue to develop the site, utilising the, as yet undeveloped buffer zone, implementing the secondary road network and seeking to intensify development to respond to the changing site context.
- **Physical characteristics:** inevitably, the physical shape and form of the landscape has not changed since the masterplan evaluation. The strong form of the land has provided the basis for the disposition of building types within the wider enclosing landscape. The topography has given a structure and legibility to the emerging campus design which has borne out decisions made in the early design for the disposition of the main university faculties, administration areas, sports facilities, car parking, the parkland core and wetland at the centre of the site and the wider landscape framework/buffer.
- **Landscape strategy:** a series of landscape character types were originally identified and described. The new proposals were framed to work sympathetically with the landscape character types already present at the site. The implementation of the proposed landscape character types both safeguards and enhances the existing landscape character types described in the masterplan by, for example, more clearly differentiating and better establishing the types on site. Viz. the area of forestry (originally present only in embryo on the southern hill slopes) is now clearly present and a separate type from the valley bottom landscape of informal parkland.
- Evaluation of availability of **water** for sustaining plant growth was also included in the strategy and a decision taken to implement generally native inspired planting within the wider and larger area of the campus with a more formal landscape (having higher water requirements) within the core of the faculty area. Water resources have again been assessed as part of the review and the success of planted areas shown to have a logical correlation with both aspect/ climate and water availability.
- **Landscape masterplan:** the requirements of the masterplan were to provide an attractive and pleasant environment in which to live and work; enhance the local landscape and strengthen and provide more weight to the surrounding planning designations. These criteria have

been achieved in the implementation of the initial phases.

- Vegetation types across the site were evaluated with strong successes in the following areas:
 - Forestry planting – this has established well and begins to form a coherent buffer to the southern site boundary, linking to the wider forest area;
 - Accommodation/student residences – only limited implementation of residences has occurred. The landscape to these is successful, sufficiently diverse for a residential area, though relatively high maintenance and high water demands;
 - Car parking areas – car parking in the wider site is problematic and difficult to manage. Fly parking is rife which degrades the quality of the environment and damages fragile soft areas. Parking areas themselves are generally successful but some remedial work is necessary to upgrade the quality including more management of litter collection and some replanting;
 - The Belvedere – this formal area is perhaps the least successful part of the masterplan due to poor establishment of the trees. A number of solutions have been offered in the detailed review.
 - Buffer planting – parkland planting has been successful as far as it goes. A better appreciation of this character type within the structure of the site would be gained by implementation of more trees. Proposals have been included in the review.
 - Safeguarded areas – parts of the landscape not proposed for immediate development were intended to be retained untouched through the initial stages. This has had limited success with the disposition of spoil being a detracting element.
- **Ecology** A variety of habitat types were identified within the masterplan. The intention of the design was to enhance the local ecology and increase the availability of local habitat types. This has largely been achieved but there is still scope for more and subsequent development of the southern buffer area (proposed for the next phase) would be likely to have a detrimental effect on the emerging habitat of the forestry planting.

Subsequent phases

Some of the lessons learned and questions which follow from the implementation of the first phases have been described. These relate to:

- water treatment and recycling – potential areas for parking and likelihood of recycling run off;
- Lake construction – potential for using subsequent lake construction as a source for a heat sink and the implications on the water ecology of doing so;
- Pedestrian connections – legibility and opportunities for incidents which intensify and personalise the campus design;
- Forestry – what are the implications for the forestry with the emerging designs for subsequent phases;
- Ongoing maintenance and management of the campus.

9.03 Planning Background

Given below is an extract from the Amendment to the Nicosia Area Plan 2006, Prepared by the Ministry of Interior, Department of Town Planning and Housing.

“Chapter 37 – Specific provisions for the vicinity of the University of Cyprus:

The site is located on the southern fringes of the built-up area of Nicosia within the municipality of Aglantzia.

An Area Development Plan for the above location is in the process of development to ensure the correct integration of the University’s diverse functions within the context of the adjacent urban fabric.

The development / construction of the University of Cyprus facilities is based on University Development Plan which includes the following principles:

- a) Integration of buildings and other facilities within the existing context in a way that ensures minimum damage to existing local eco-systems.
- b) Correct integration within the existing landscape and existing geological morphology/terrain of the area.
- c) Utilisation of all necessary technological and mechanical means to minimise the negative effects on the natural environment.

An important issue to be resolved in the development of the Area Plan is

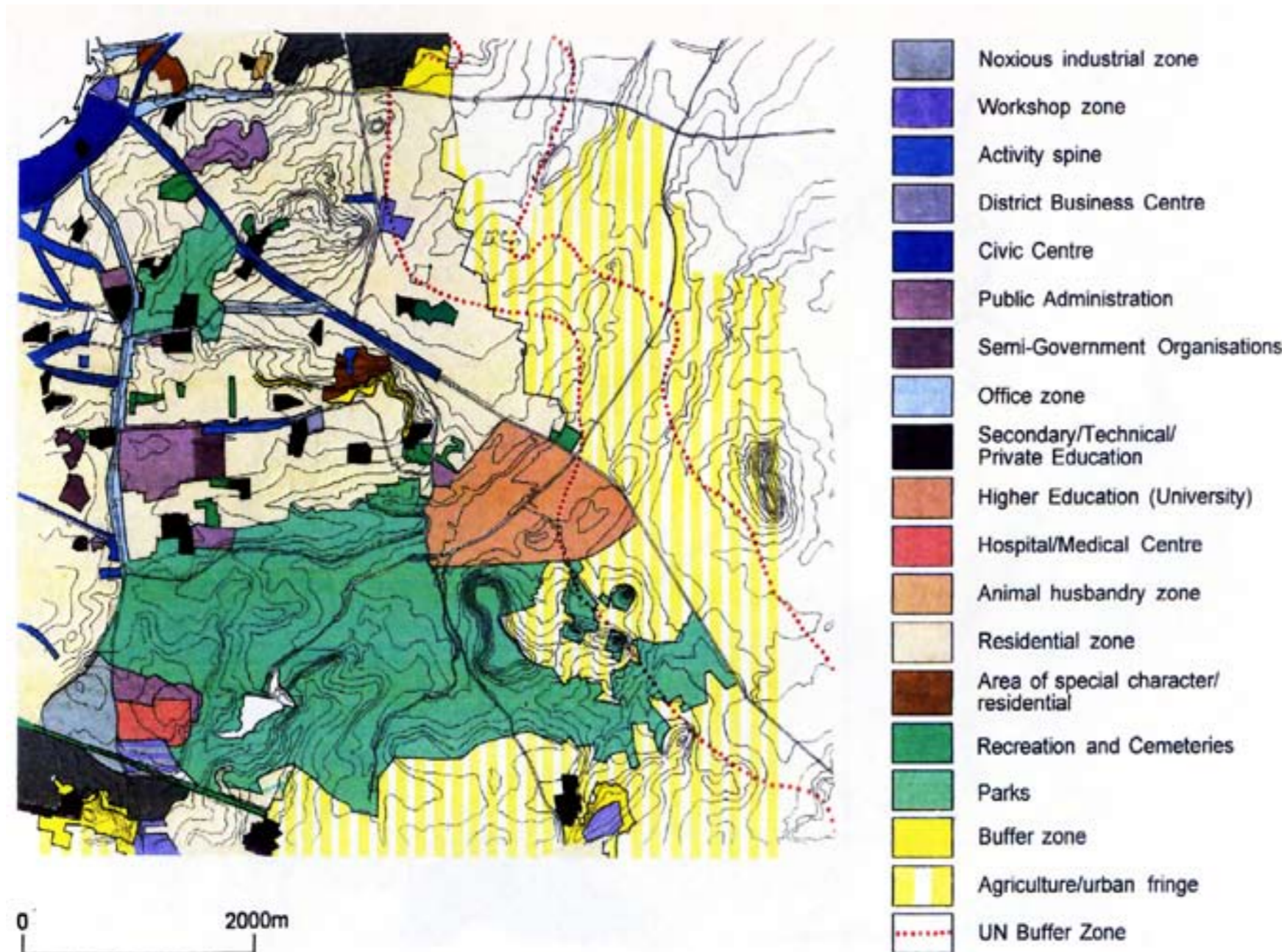
the immediate implementation of part of the urban transportation system plan. Such implementation is expected to contribute to the smooth functioning of the University. Transportation projects must encourage, support and provide means for use of the bicycle as well as pedestrian use to and from the University Campus.

Prospects of Development
The area offers important prospects for development since:

- a) There is plenty available undeveloped land due to the adjacency of the site to the Buffer Zone.
- b) The area is ‘mature’ ready for development due to the long period required for the completion of the University projects.
- c) There is potential for the development of a high standard secondary road network.
- d) There is a greater awareness by the private sector of opportunities as a result of the completion of a number of projects at the campus.

The prospects for the development of the area concern the gradual creation of an area in Aglantzia that not only secures the balance between uses, the preservation of the natural/physical environment, the promotion of a high quality built environment and the satisfaction of a variety of needs for different age groups (and ages), but also provides prospects for the location of a great variety of different use categories (commercial cultural entertainment, recreation, research etc).”

The landscape masterplan has taken a number of the tenets of the planning policy given above which are embodied in the landscape strategy for the site.



9.04 Landscape Survey

9.04.1 Topography

There are four distinct topographic zones within the site:

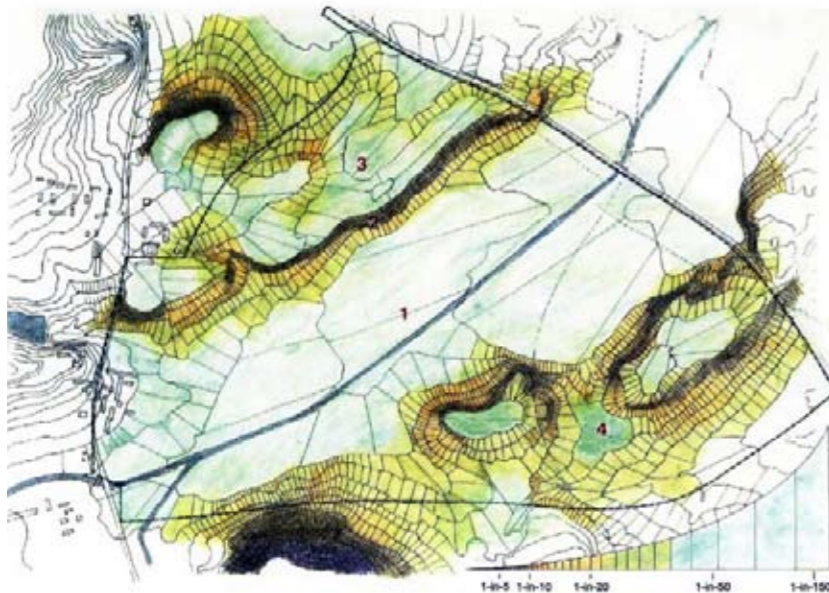
- 1 The central valley aligned alongside the Kaloyeros River, occupying approximately 50% of the site area;
2. A distinct ridgeline on the northern edge of that valley floor, occupying approximately 5% of the site area;
3. A plateau area in the northern portion of the site, occupying approximately 15% of the site area;
4. An undulating plateau area to the south, occupying approximately 30% of the site area.



The variety in the site topography offers opportunities to develop and emphasise these variations as well as determining particular site uses.

The topography of the site remains as the original evaluation which is given above. However as part of the construction of the university faculties a great deal of spoil has been generated. There has been a detrimental effect on areas where it is deposited. It was proposed that spoil be deposited at the south eastern extent of the valley side which lies within the buffer zone. The spoil could usefully be disposed to reduce the gradient of the valley side and soften the bowl which runs into the buffer zone at the site boundary.

The spoil is currently located close to the plantation of palms on the western side of the site and in areas west of the lake. The further disposition of



spoil in these areas will be detrimental to the rooting zone of the palms, is unsightly in the overall view of the landscape and spoil already tipped should be removed to remedy this (see photographs).

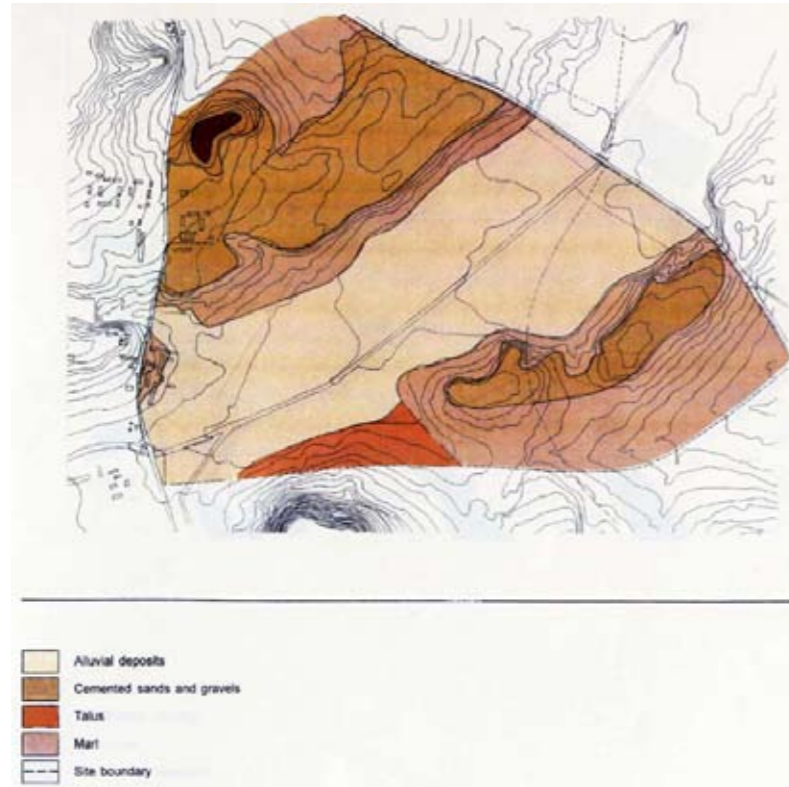
9.04.2 Micro-climate

This topic was not included in the original masterplan, perhaps because no detailed information was available or perceived at the time of its generation. It is evident however, that microclimate has affected planting success in some areas of the site.

The site is by nature arid, and the aspect of each of the planting areas has proved to be contributory to plant establishment in that the northern facing slopes have a slightly increased capacity to retain soil moisture, which is therefore available for plant growth. On the south facing slopes the aspect and wind exposure contributes to moisture being quickly lost from the soil making plant establishment more problematic.

The upper plateau of the site is found to be extremely windy and in this area planting was originally set out in avenues or other formal arrangements to give structure to the main vehicular approach, pedestrian belvedere and building environs. The affect of this style of planting is to give no protection to individuals (particularly trees) which have suffered from the continual buffeting of wind, increased transpiration rates and difficulty of establishing stabilised root zones.

Whereas the woodland areas, which are generally north facing, have the benefit of a slightly increased level of available soil water and planting is closer spaced which gives a modicum of shelter to adjoining individuals. The planting within the woodland structure has as a result established better than exposed sites within the formal areas of the site, where avenue trees in particular have struggled to establish successfully.



9.04.3 Geology and Soils

The masterplan sets out the geology and soils of the site as follows:

The site has a marl bedrock throughout, with various drifts on top including:

- Alluvial deposits of sand, silt and gravel on the valley floor
- Cemented sands and gravels on the higher terraces
- Talus at the foot of Aronas Hill.

The underlying marl outcrops on the ridge and in an extensive area on the site's south eastern boundary. Because it is a rock that is prone to shrinkage and expansion, irrigation of plants close to building will require detailed consideration.

Soils within the floodplain are generally a mixture of medium to fine sands, silts and clays, with a relatively high pH and low organic content.

On the plateau areas, soils possess greater quantities of coarse sands and fewer silts.

The geology and soils of the site remain as given (above) in the 1994 report. Planting has been selected for the local soil conditions. Success or failure of plant species is partially dependent on soil conditions in that the light friable soils of the site have low nutrient status and low organic content. Their gritty, high pore content does not offer good anchorage opportunities necessary for plant establishment or fast root growth. In some locations such as the upper plateau to the administration areas remedial action is necessary to stabilise the root zones of the trees, particularly where the marl outcrops on the ridge, leaving relatively shallow rooting/soil depth above it.



9.04.4 Vegetation and Ecology

With the establishment of the early phases of the campus the balance of designed areas to agricultural uses has changed. The north facing slopes of the southern site have been successfully planted with woodland structure planting and the upper northern areas are now within the designed zone of the University.

The status of existing vegetation types is as follows:

Type 1 The centre of the site, within the valley of the Kaloyeros River remains in agricultural use, although the lack of rain this spring has led to a parched appearance. This zone is reduced by the development of the university faculties to the north.

Type 2 Eucalyptus trees - eastern end of the site – this mature plantation of trees has recently been thinned and has good canopy closure within the group. Further thinning may be necessary in years 5-10 to keep the trees from being overcrowded. Uptake of moisture in this former marshy area has increased and there is apparently less problem of marshy ground.

Type 3 New forestry planting on the Aronas Hill and fringes. This planting was implemented by the Cyprus Forestry Commission and is now well established. Approximately 5-10 years older than the University campus forestry, it shows how the structure planting will progress.

Type 4 Palm trees. This loose grove of trees on the western site fringe forms an important character type on the campus. It has been identified by the CDO as a) a high priority protected area; b) no new buildings should be considered to be located within this area; c) the existing warehouses have potential to be remodelled/extended and d) the old aqueduct should be protected.

The palm trees are under threat from the spoil filling in the vicinity of their root zones and potential road diversion through area. Some specimens have already been successfully transplanted and this should be considered for others which are on the alignment of proposed road. Spoil temporarily placed in this zone should be removed to an area which is properly designated for spoil placement, e.g. the inside of the bowl to the south eastern part of the site where spoil can be used constructively to re-profile the steep existing gradients.

These planting types have been augmented by the campus planting and this is described further below.



9.04.5 Landscape Character

The masterplan described the site as having a generally rural character with the wider area containing:

- To the south a rural and picturesque landscape of agricultural uses interspersed with small blocks of woodland. A generally rolling topography is broken by dramatic steep-sided and flat topped hills.
- To the west, in the land around the Athalassa Park, the character is more wooded with a hilly topography and relatively more intensive agriculture.
- The Athalassa Forest has been developed with a more parkland character immediately adjacent to the site at Ayios Yeorghios Park.
- To the north, although not completely developed, the character will become increasingly suburban as residential development takes place.
- To the east, within the UN Buffer Zone, is open agricultural land in a rolling valley.

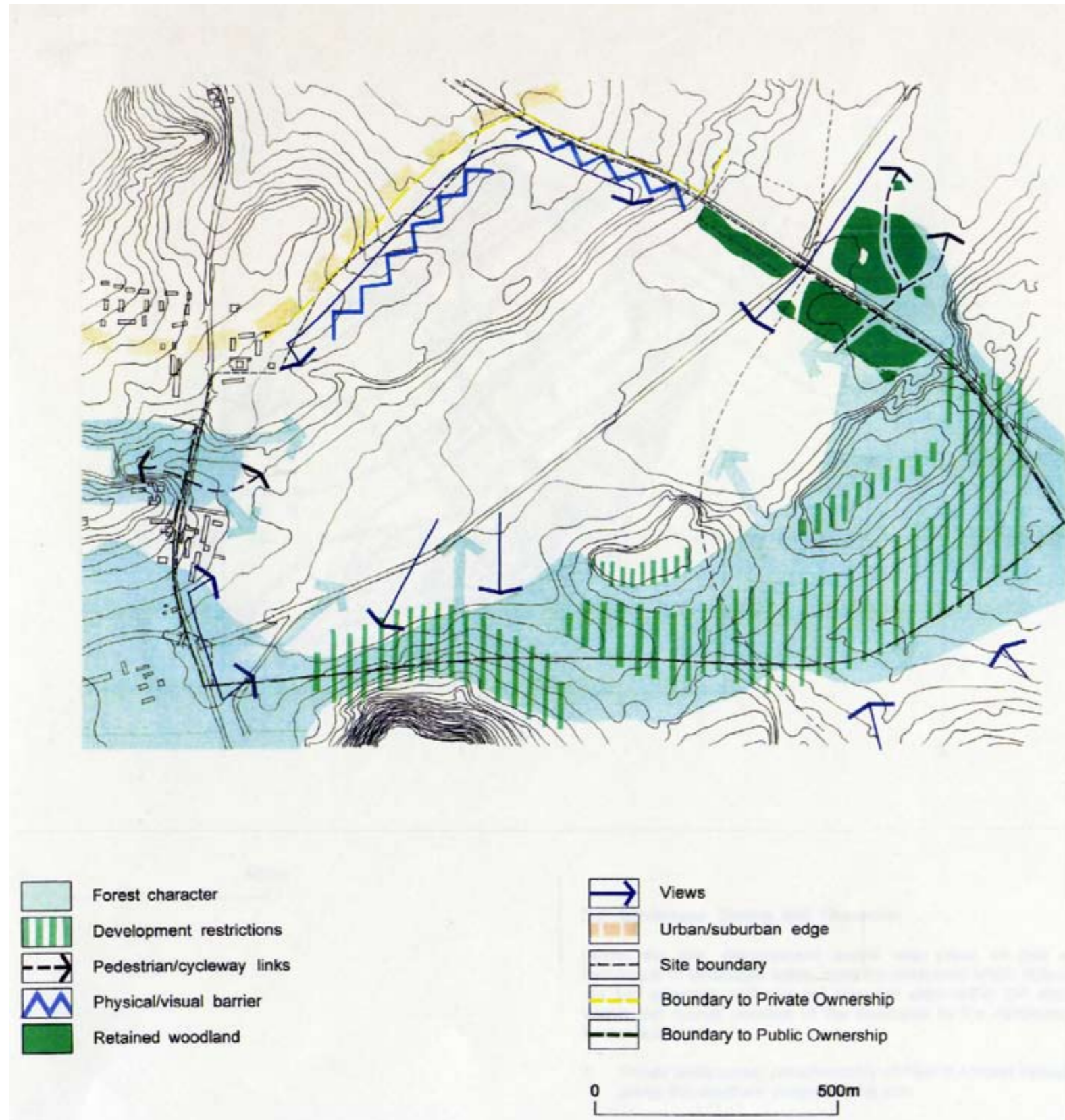
The imposition of the designed campus landscape on this rural character has been to give a more structured appearance to the landscape of the northern part of the site. The southern area still retains a great deal of its rural character, which is unchanged by the planting of the woodland along the fringes to the Aronas hill. (photos of wider area) The affect of this woodland is to give the boundary of the site slightly more definition and to bolster the existing Forestry Commission planting.

The area close to the river continues to have a rural character with loose plantings of trees and the marginal vegetation associated with the lake.

The structure of the landscape associated with the main campus buildings and faculties was designed to be well structured and laid out in a formal manner. This ordered development of the buildings within the landscape framework is clearly defined and by using the change in topography to align and distribute the faculty zone of the campus above the break of slope to the valley bottom, the development is clearly intelligible to the wider landscape whilst preserves the continuity of the wider sweep of the river valley.

9.04.6 Visibility

The site was originally described as being visually well contained, with views into it limited to only a few locations, from the west on the Yeri Road, and from the east on the Old Larnaca Road. Views from these locations still exist, but containment along the northern edge will be improved by the completion of the new highway and its attendant planting on the northern fringe. Proposals for this planting were part of the original landscape package and should be implemented when the highway is completed.



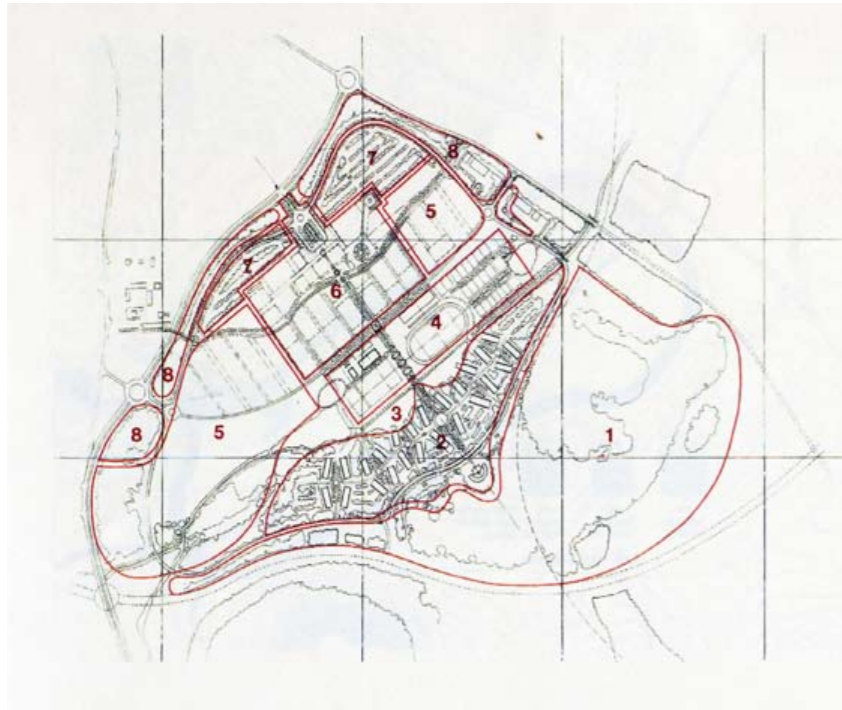
9.05 Landscape Strategy

9.05.1 Planning Strategy

The masterplan provided a planning strategy in the form of a landscape framework to the campus whose success is evaluated below:

Six original precepts were put forward – with comments on the implementation adjoining:

- Extending the Athalassa Forest throughout the site – the strategy for forest to enclose and structure the extent of the site has been successful and it is possible to see that in 5-10 years this will be stronger and provide a good framework to the wider area of the campus. The impact of inclusion of built development within the forest environment is considered in more detailed in sections 9.08.1 and 9.08.6.
- Limiting built development to the base of Aronas Hill – no development has occurred in this zone yet, but this zone will be the site for later phases of the campus including a new road. Notes on the strategy for this area are included in section 9.08.6.
- Creating a more open parkland character at the Kaloyeros Valley – this has not been well developed and is not clearly ‘parkland’. Loose planting of trees close to the lake has been implemented, but a wider planting plan should be brought forward, when the current agricultural use of the land begins to give way to the wider campus development.
- Pedestrian and cycleway links between Athalassa Forest and Ayios Yeorghios Park – the cycleways have not been implemented. Accessibility to the site by public transport, cycles or foot is the subject of further research by others. Parking at the campus is problematic and fly parking is likely to damage landscape planting and is detrimental to the overall image of the site.
- Physical and visual barrier between suburban edge of Nicosia – once the construction of the Yeri Road is complete this will be achieved, especially with the establishment of the planting associated with this part of the scheme.
- Linear park of existing woodland at eastern site edge – this zone has been identified as a location for future car parking. Use of this zone would comply with the strategy for peripheral parking which retains the heart of the campus as a car free area. Careful design of the car park within the existing trees should be possible retaining the overall woodland cover and supplementing it with new trees within the body of the parking area.



9.05.2 Landscape zoning and character

The success of landscape zoning and character has been evaluated across the site (numbers refer to the zones on the adjoining plan) and brief comments are given below. More detailed comments on the success of each of the zones is given under 9.06:

1. Forest landscapes - good success, planting taking well. Substantial growth rates, good visible impact and enclosure to lower hill slopes;
2. Forest fringe – this area is still predominantly agricultural in character. Limited planting has been undertaken mainly associated with 3 below. The development of this character type will require further targeted planting.
3. Water bodies – good success, lake no..1 full, in spite of drought at April 08 site visit. Over excessive reed growth – this needs management to ensure that a portion of the lake margin is kept clear to allow access by both native species (birds, mammals) and visitors to the waterside. There is the potential for development of other water bodies based on the success of this lake.
4. Sports/recreation zone – some success with planted areas. The concept of water within the landscaped area is a strong one and has a potential cooling effect on the adjoining garden areas. The sports area is not 'lush' as originally conceived – the main pitch is artificial grass surface. The area is dominated by the high level lighting on a large number of columns. There are good links across the site to main admin building via the bridge / and the sports pavilion.
5. Informal parkland in area 5 – this zone has limited planting and has not achieved the characteristic of informal parkland. A programme to introduce new planting to this area should be planned for subsequent phases.
6. Urban Landscape – tree planting / establishment of planted areas has been achieved with variable success. Because of the wind and arid conditions stabilisation has been problematic, some remedial action necessary to achieve coherent structure to the site's tree planting framework.
7. Car park areas – some planting failures – issues with parking outside designated areas – these are generic with the whole site. Protection of planted areas is necessary to allow the proper establishment of planting, especially of lower growing species. Complete absence of some species suggests that not all the stock was planted as described in the drawings. Management of litter collection has been tackled since the site visit and CDO reports better standards of care are now in place.
8. Buffer planting to the Yeri Road - this area has yet to be implemented. The planting proposals should be reviewed on



completion of the current road widening works to confirm that they are still relevant to the finished road alignment.

9. Roads and pedestrian routes – again some problems associated with establishment in very windy areas. Remedial work is necessary to achieve better quality and more unified avenue trees in a number of locations. See further comments under 9.06.4.

9.05.3 Water supply recycling / use and availability

Water is supplied to the campus from a variety of sources: borehole supply, recycled water from treated sewage effluent and grey water from rainwater run-off. There is also a supply of water available from the hospital recycled source, but the quality of this is apparently variable and it is not currently used to supply the campus.

It seems that there is not a problem with supply of water to the planted areas and establishment of planting has not been problematic due to lack of water. Tree planting is irrigated to full saturation for the first 2 years and then reduced to 50% supply in the 3rd year. It is subsequently reduced to 25% of the original dose per plant. This means that as planted areas become established their water requirement reduces, freeing availability of supply to subsequent parts of the scheme. The detailed analysis of water supply and sources is being prepared by other members of the consultant team (see Chapter 12), however observations on the use of water with the landscape are set out below, both in terms of ecological value and in aesthetic design considerations.

It is our observation that rather than conserving water the landscape schemes associated with individual faculties have been detailed using species that are not specifically adapted to reduced water requirements. This is particularly relevant to open grassed areas and where species are associated with temperate climates – such as tea roses. The longer term implications of using non-drought tolerant species is that as the campus develops and larger areas are planted in association with new faculties there may not be sufficient water to maintain the whole of the site.

Conversely, as the student numbers on site increase there is likely to be more water available to the system as recycled water from treated sewage. This may provide more water, in contrast however, the reliability of the supply from the boreholes is unknown and its supply cannot be predicted long term. Whilst the water supply is subject to a number of variables it makes sense to be prudent, protect the future water supply and use it in a controlled fashion. Planting areas with high water requirements may give a lush appearance in the short term but may not be sustainable long term. Planting species which are sustainable in terms of being adapted to drought conditions, using locally available and native species is also a better choice for perpetuating the ecological diversity of the site, providing greater habitat for birds and invertebrates for example.

It is therefore proposed that subsequent landscape schemes in the context of new faculties should be approved only on the basis that they contain a high proportion of native or drought tolerant species. This should not limit the design or character of the landscape, but may require more ingenuity.

9.05.4 Sports

This area has been substantially implemented. The overriding impression of the zone is dominated by lighting columns. Parts of the adjoining landscape scheme have been successful, but one area – proposed as the site of the swimming pool has failed in successive years. This requires a temporary planting scheme which will provide a backdrop to the adjoining areas until the swimming pool is developed. It could also be used as a nursery site to support other areas of the campus, growing trees or shrubs for use elsewhere.



9.06 Landscape Masterplan

The landscape masterplan has been designed to fulfil a number of requirements which include:

- Provide an attractive and pleasant environment in which to live and work;
- Enhance the local landscape;
- Strengthen and provide more weight to the surrounding planning designations.

The plant types, scale, density and arrangement of planting was designed to reflect local character and the surrounding site uses. The main vegetation types are as follows, which also includes a review of the success of each type, plus remedial action where appropriate:

9.06.1 Forestry planting in a grid along the southern extent of the site has established successfully. Some localised pest problems limited to Pinus species should be treated with insecticide to reduce spider infestation, which defoliates the tree if left untreated. There is an over predominance of Cypress species within the forestry, which should be thinned so that the narrowly columnar, dark Cypress trees are seen as accents to the wider forestry planting rather than as a part of the generic woodland mass. Approximately half the number should be removed leaving Cypress trees which are at corners of the planting area, leading edges or within the curve of the topography so that the Cypresses punctuate the overall mass of planting. The landscape architect could assist by marking trees on site to be removed if desired.

9.06.2 Accommodation – student residences: Student residences have been built to the north west of the site and the landscape has been successfully implemented. The planting is diverse, with shrub planted borders and small lawns. The planting gives character to individual spaces around the buildings helping give identity and orientation to the visitor. The spaces formed are pleasant and domestic in scale, appropriate to the residential environment. Subsequent phases of the university would do well to emulate the creation of this series of intimate spaces, which have good diversity, good use of soft landscape for screening and containment and excellent foil to the built development.

9.06.3 Car parking areas: These are predominantly to the north of the main Admin building. The shrub or hedge plantings have established successfully, providing good containment of the parking area from areas outside it. Small bays planted with herbaceous species to break up the length of parked cars have been difficult to establish. Cars have been parked over the bays intended as planted areas and plants are unable to get established because of this trafficking. In order to combat this, the edge of the planting bays should be fenced to prevent access until new and gapped up planting has become established. Equally a new tree with tree guard could be planted on the end of each of the planting beds to protect the soft planting area.

Litter collection on a weekly basis will help to keep planted areas clear of debris and improve the quality of this location.



9.06.4 The Belvedere:

The main pedestrian spine accessing the faculty buildings. This walkway was planted with Pepper trees which have struggled to establish in this open, exposed location on top of the plateau. The trees were planted as small specimens, in relatively shallow pits on top of the rocky plateau edge. Planting small trees was partly a product of stock availability and partly thought to promote better establishment in inhospitable climatic conditions. This has proved to be a successful strategy elsewhere (in the forestry zones for example) but here where there is no shelter from wind the trees have been continually shaken, preventing proper root establishment. This in turn has led to the contractor heavily pruning the crowns of the trees in a bid to allow the roots to establish. The contractor has also used an ad hoc strategy for remedial stabilisation – staking with ill assorted pieces of timber etc, which are neither wholly successful in stabilising the roots nor successful in promoting straight trunk growth. The result is that many of the trees still rock in their pits, have ill-shaped crowns or trunks, are undersized for the length of time they have been planted and do not form a cohesive avenue.

In order to establish a clear avenue of well matched trees the following remedial programme of replanting the Belvedere trees should be undertaken. This is a matter for discussion within the university management staff. If it is felt that the trees are sufficient in their current state they could be left insitu, but it should be borne in mind that they will never reach maturity until the roots are stabilised. It is Novell Tullett's recommendation that the avenue be replanted as follows:

- Remove paving to enable a trench to be excavated – where root zone is shallow, an alternative linked, linear rooting area can be provided to give the trees adequate anchorage and space for moisture collection.
- Select a species to replant the Belvedere using a species which has adapted more successfully to the local climatic conditions – e.g. Jacaranda, Ceratonia siliqua or Ficus species. Preferably source semi-mature specimens which can be planted at 5m height to make up for the lost growth time – this may be an expensive option, but the structure of the walk, lack of shade and incomplete appearance of the Belvedere does not encourage its use by pedestrians.
- Plant new specimen trees, securing the new trees with underground guys using a proprietary system of below ground anchors to ensure proper root establishment and the viability of the new trees.
- Trees taken out of the avenue should be replanted in the parkland areas of the site, where their non-uniformity is not an issue. Care should be taken to stake or underground guy the transplanted trees to ensure that the trees can properly establish in their new locations.

Tree planting within car park areas along the north eastern fringe of the site, close to the Old Larnaka Road is also suffering from similar problems with the non-establishment of some of the species. Similar remedial action should be proposed.

9.06.5 Success of buffer planting: Parkland planting in the valley bottom close to the first lake has been implemented and the trees have established well. However, the area of this character is relatively limited. Trees removed from the Belvedere should be salvaged and replanted within the parkland zone where their variable form is not so critical.

Safeguarded areas: Safeguarded areas were defined in the masterplan as zones where development was not proposed in the early phases of the development which would be protected from encroachment by contractors on adjoining sites. It was proposed to protect these areas from encroachment to maintain existing vegetation cover, thereby reducing dust and erosion and retaining the site's visual qualities.

Protection of safeguarded areas has not been entirely successful mainly because of finding areas for the disposition of spoil arising from construction sites has not been sufficiently controlled and inevitably some spoil has been dumped on safeguarded areas. This has meant that these areas have become unsightly, with localised mounds of material and the inevitable damage to flora which this will entail.

As part of the development of the southern zone, the incorporation of spoil arising from construction project should be properly addressed. Spoil should be removed to a location in the southern zone where it can be profiled to a gradient which is suitable in the context of the wider landform. An existing bowl on the south eastern extent of the site has been identified as a location where spoil could be disposed to regrade the landform, making a more gentle gradient and feathering the hillside into the valley base.

9.07 Ecology

The masterplan set out the intention that a variety of ecological habitats would be created in line with the phased development of the University. These habitats would include:

Forestry and forest fringe types – based predominantly on pine woodland and its associated ground flora which would be allowed to develop naturally. Because of its proximity to the Athalassa Forest it was anticipated that early colonisation for flora and fauna associated with the existing forest would take place.

This has been successful in that a native grassland and perennial weed population has colonised areas between the tree planting in the forestry areas. No shrub/understorey or larger woody species have been observed to colonise the zone, but it is hoped that as the woodland develops further and canopy closure is achieved a more specific flora will develop which is generic to the local woodland conditions. Shrub and understorey species should be allowed to colonise the fringes of the new woodland to give a more balanced and graded edge to the higher tree species.

Denser woodland will then start to provide a habitat to larger mammals as well as to the birds which have begun to colonise this area.



Example of structures/incidents that could create pedestrian focus, provide shade or indicate the proximity of entrances along the Belvedere

The proposal to extend and maintain this habitat through the development of the southern zone is a good one, especially where links can be made to the wider landscape with continuous planted cover providing habitat corridors between the Athalassa forest and the buffer zone.

7.2 Aquatic and marginal habitats associated with the lake – these have established well and marginal fringe vegetation has colonised the lake edge. It is however desirable to maintain some clear areas of lake bank so that particular bird species (for example) which prefer open access to water are able to use the lake environment. Because reed species tend to dominate this kind of environment (and have done in this instance) keeping some of the lake edge clear of reed growth also allows the possibility of other less robust emergent species to colonise the lake margins again creating a more diverse habitat to the water margin.

7.3 Grassland areas containing groups and individual trees to provide habitats for annual and perennial plants to establish themselves. The establishment of a parkland-like character type has been less successful than some of the other character types because a relatively small area has been planted up. Grassland associated with this type includes annual and perennial plants which form the ground flora, important for birds, insects and invertebrates. A mosaic of low growing grass based plants may vary throughout the year, being most prominent in the spring when the plants come into flowering. With the drought conditions at Spring 08 there was little evidence of colonisation by this type of habitat but the seed bank for its establishment would be present in the soil from previous years. It is likely therefore that this habitat type has already established itself but requires more rainfall to be evident within the wider landscape.

9.08 Subsequent phases

9.08.1 Framework

The landscape strategy for the southern zone of the campus is still valid and should form the structure of new development in these areas. YRM have produced a sketch scheme for the wider area which embraces the character of forestry within which the new faculty buildings may be developed. It should be borne in mind that a quantum of forestry planting is required to maintain the illusion of woodland, the balance of planted area to the ratio of built development should therefore be considered before plans are finalised.

9.08.2 Water treatment and recycling

Reed bed technology: at present the method of treating grey water before it is used for irrigation, is to dose with chlorine. This is arguably expensive and not ecologically sustainable when the water is used for irrigation. The proposed extension of the campus into the southern zone will necessitate the building of further car parking zones, either externally or in the undercroft of the buildings.

The benefits of underground car parking include safeguarding the landscape zone, retaining a larger framework of trees planted as forestry as a setting for the new buildings and limiting the impact of large numbers

of parked cars in elevated locations on the wider view of the southern zone. Conversely open parking areas also have their benefits in terms of generation of water run-off and in conserving water which would otherwise be necessary to irrigate larger planted areas. Should external car parking be preferred because of the benefits above a more sustainable solution to the collection and treatment of the rainwater run-off could be in the form of reed bed/swales which treat run off by filtering the water through the bacteriologically-rich root zone of the reed bed before it is returned to the water system. Before a decision to introduce reed bed filtration is adopted the likelihood of providing a habitat for mosquitoes to breed should be investigated. The lake has not been a source of mosquitoes because of the introduction of a particular species of fish, which controls the larvae growth. Stagnant water may be a habitat which is more difficult to control.

9.08.3 Lake construction

The profile of the constructed lake is deep, to reduce water evaporation. The water supply to the lake appears to originate from the topping up of the lake upstream from a borehole and a sweetening flow which is the overflow from this lake. The potential of a second lake as a water supply is unknown, but the water level in the existing lake even in times of drought appears to be a good indicator that this water supply may be sustainable. A second lake may have potential as a heat sink, although the criteria for effective heat dissipation (shallow lake, large surface area) conflict with protecting the water level – e.g. water should be as deep as possible to reduce surface evaporation.

9.08.4 Pedestrian connections through the campus

The design of the southern zone should consider the inter-connectivity between the faculties. The design of the early faculties included connections to the north and south, e.g. to the Belvedere and to the southern access road, but may not have considered the importance of lateral connections. This has led them to be potentially less accessible to students and staff. Small scale, pedestrian-only routes give a further layer to the hierarchy of movement across the campus and allow the possibility of the creation of incidents which give unexpected delight to the user. These incidents are important because, as the campus grows, they lend a new level of intensity which is helpful in orientation and differentiation between areas.

Subsequent phases should provide pedestrian friendly access between related faculties so that the main thoroughfares are not the only method of accessing the buildings.

In addition, where major paths, such as the Belvedere, reach the entrances of new faculties etc the inclusion of identifiable structures/planting groups or incidents should highlight the arrival point. Such incidents will help to give legibility and identity to entrances, and the character of these should be linked in some way to the adjoining building or entrance. Changing the dimensions of the path, broadening it to include a clear view to the faculty entrance may also aid the visitor.

Where infrastructure and residences are proposed to the south of the



Example of structures/incidents that could create pedestrian focus, provide shade or indicate the proximity of entrances along the Belvedere

campus pedestrian links along the riverside should be designed with bridging points to give access to proposed buildings. Other informal recreational routes should be considered through the parkland area and to take advantage of the new and existing lakes. The character of these routes should be sympathetic to the wider landscape area.

9.08.5 North West Site Boundary

In anticipation of the completion of the new highway on the northern site boundary, YRM have proposed a series of student residence buildings (potentially with basement parking) between areas of at-grade parking. This would have the function of creating a better defined edge to the campus, punctuating the parking zone thereby making it more positive and legible.

With this in mind, the entrances to the residences should form a series of incidents along the university's primary northern road they should be individually differentiated, with a strong pedestrian focus and access. Secondary pedestrian routes through the parking areas should also be considered in order to provide attractive lateral links. Important crossing points on the access road need to be made clearly identifiable so that pedestrians have safe and easy access to the residences from the wider campus area.

An assessment of how the views of these new buildings would interact with those of existing buildings should be made. In particularly the clarity of the approach to the Admin building should be safeguarded, so that new buildings contribute to the formality of the existing layout.

9.08.6 Forestry Planting

The emerging designs for subsequent phases of the university include proposals to develop the southern buffer zone. This will be implemented within the young forestry planting. There are a number of considerations to be borne in mind if this is to be carried out. Inevitably the construction of buildings in this area will necessitate the clearance of planting to accommodate the building footprints. More than this however, the need to regrade large areas of the forestry zone to accommodate infrastructure, provide access, parking etc will remove a great deal more of the planting and may lead to the wholesale fragmentation or even removal of the mass of the forestry in the steeper areas of the site.

As the trees are yet relatively juvenile, it is possible that a programme of replanting the displaced trees could be embarked on, provided that trees were well secured and an enhanced watering programme implemented to enable their reestablishment in new locations. Notwithstanding the potential for reestablishment of the existing trees a programme of new planting will be necessary to 'gap up' the zones where many of the trees will need to be removed. With the extent of the building proposed at this stage it should not be envisaged that the buildings will be 'enfolded within a woodland landscape' – this will not be the case and it is highly likely that by far the majority of the trees will be lost in the redevelopment.

9.08.7 Evolution and ongoing maintenance/management of the Campus landscape.

As the wider campus develops and the landscape evolves, the University should look to employ a permanent staff member with horticultural knowledge. There are easily solved issues with the implemented landscape which have not been addressed by the contractor to date. A dedicated member of staff with horticultural experience would be beneficial so that problems can be more readily identified on site and quickly remedied. The university would not therefore be subject to the vagaries of the contractor (the contractor's remit has not been to offer solutions to defective maintenance to date). In addition a site management strategy should be drawn up which gives management objectives plus design objectives for each of the landscape/vegetation types so that the university is able to gauge the success of individual areas against this blueprint.

9.08.7 Water conscious design of new landscape areas.

Subsequent phases of the university should include positive proposals for conservation of water resources particularly in the planting design. When competition briefs are compiled for new faculties/building projects which include external areas, one of the requirements of the design brief should be that the successful designer resists using non-native plants or plants with a high water requirement. Sustainable planting design, which when established, is able to withstand both the local windy, arid microclimate and has low water requirements would contribute to the long term success of the landscape potentially eeking out the available water to ensure that it is sufficient to maintain the whole campus once all the areas are developed. This should not in any way limit the creativity of the designer, nor produce low quality planting designs.

The long term management of the site will naturally entail the replanting of areas, particularly closely linked to the built development, in due course. As with new schemes, where replanting becomes necessary the landscape designer should look closely at water requirements and where possible native or species with low water requirements should be preferred to those which are moisture hungry.

10.0 UTILITIES AND ENERGY REPORT

10.01 Introduction

Faber Maunsell was appointed to review the energy strategy as part of a strategic review of the whole masterplan for the university campus at Athalassa. This review had become necessary as the original strategy had been set in the early 1990's. Since then, the first buildings had been built and occupied, and others were well advanced in their tender or construction phases. Some of these buildings occupy a significantly larger footprint than was envisaged in the 1994 masterplan.

The university is now considering the next phase of the development programme which includes the very large Faculty of Engineering, the Department of Biology and two other smaller buildings. These next phase projects will add a further 36,400 square metres of built area. It is felt appropriate at this time to review the original energy strategy assumptions against the subsequent development, and to identify if any adjustments need to be made to enable the proposed future development.

The original energy strategy has proved to be robust and the energy centre has provision for enough capacity to see the university through several more years of development. The modular approach means the additional capacity can be provided in line with the development programme. However, the current masterplan review has determined that larger student numbers are projected and the evolving briefs for future academic buildings means that more built area will be required than was envisaged in the initial masterplan.

With the progressive understanding of the impacts of climate change has come a fundamental shift in the approach to the energy strategy. There is now an imperative to reduce the energy consumption of buildings and to introduce renewable energy sources wherever practical. While the centralised energy plant remains a valid approach, the emphasis of the energy strategy will now need to change to one which reduces demand first, and then considers possible renewable sources, before increasing capacity in the central plant.

10.01.1 Background

With the high ambient temperatures in summer, the primary energy demand for the university is cooling. The energy strategy set out in the early 1990's consisted of a centralised chiller compound near the eastern boundary of the campus. From here a "ladder" network of insulated underground pipes supplies chilled water to the various academic and administration buildings. The estimate for the cooling demand for the fully developed campus as envisaged by the masterplan at that time was 14MW. The chiller compound was laid out to be able to deliver this full demand by adopting a modular approach. Space was allowed for 14no 1MW air cooled chillers, each with their own transformer. To date 4no chillers have been installed.

In the early nineties when the strategy was set, the impact of impending climate change was not well recognised nor understood outside academic circles, and there was little public appreciation of the need to reduce carbon emissions. Therefore the energy strategy did not include any

renewable technologies, or combined cooling heating and power plant.

10.01.2 Methodology

The methodology that has been adopted in this masterplan review takes as its starting point an analysis of how the early buildings have performed. The focus has been on the cooling demand as this is the primary energy consumer. Information for this has been provided by the engineering department of the CDO. From this data, parameters have been identified which are used in projecting the energy use of future buildings. Benchmarking of the parameters has been done in discussion with CDO engineers, and by using Faber Maunsell's experience of comparable projects.

The energy strategy for future development looks at how much development can be served from the current energy centre, and identifies that a second energy centre will be required to support the final development. It also reviews ways of mitigating the future demand, and suggests options for introducing renewable energy technologies.

10.01.3 Sustainability and renewable energy

Sustainability should be at the heart of the future energy strategy for the university. Not only will this reduce the demand on the central energy plants, but it will ensure that the university is at the forefront of the environmental agenda in Cyprus. While this is a very important aspiration, it will also have the practical benefit of mitigating the ever increasing cost of energy derived from fossil fuels. In addition, the evaluation of new and emerging technologies would provide research projects in their own right.

A number of sustainable and renewable energy strategies are discussed in more detail later in this report. However, much more analysis is needed before there can be any firm proposals about which technologies will deliver the most economic options.

The University has the vision to be a leader in Cyprus in terms of sustainable construction. As the major academic institution of the island it needs to encompass an exemplar role on this matter. It is recommended that a method for evaluating the environmental performance of the construction should be put in place. This method will reveal how the University fares in terms of sustainable construction and will aid with setting goals for future construction. Such a method could be the international environmental assessment method that has been developed by the Building Research Establishment (BREEAM International). This method can be applied to buildings in Europe, outside the United Kingdom and it is widely internationally recognized as the premier building environmental assessment method. These aspirations should be incorporated into the competition document for all further building development.

10.01.4 Centralised versus de-centralised energy strategy.

Sustainable energy strategies, such as those described in detail later in this report, are appropriate for specific buildings or groups of buildings. In the next phases of the master plan, the Engineering and Biology buildings would provide an ideal opportunity to employ some of these renewable strategies. However, these should be seen as supplementary to the

centralised energy strategy that has been developed so far. The localised renewable technologies will reduce the overall demand on the centralised system, and therefore help to delay the capital costs of expanding the infrastructure. But the centralised system provides economies of scale and takes advantage of diversities in building peak loads because of differing use patterns. The two systems need to be carefully integrated to deliver the best value for the university as a whole.

10.02 Utilities and Energy Report

10.2.1 The Current Position

The original utility demand assumptions projected a maximum cooling demand of 14 MW for the fully developed campus, which at the time was envisaged at about 110000m² of built area. This demand was to be serviced from centralised energy plant located on the eastern edge of the campus. Space was allowed for 14 No 1 MW air cooled chillers. To date, four of these chillers have been installed and these serve the buildings that are completed and occupied. The estimated cumulative demand of these buildings has been reported by the engineering department of CDO as 3.6 MW, while the simultaneous maximum demand is 2.3MW.

In order to provide the electrical demand for the University, a new primary substation was established near the eastern side of the campus. This substation has a total capacity of 24 MW, of which the university has an availability of 6MW. The current demand is approximately 2MW.

10.02.2 Cooling demand

Now that the early phases of the campus have been delivered, it is clear that the original projections of 14 MW for the fully built out campus were over optimistic.

The estimated demand for the buildings already completed and occupied is 3.6MW, as advised by CDO. However these buildings are larger than originally planned, adding 57% of additional gross area. In addition, the increase in total projected student numbers to 10,000 means that more area must be built, increasing the original masterplan area assumptions by 172%. As most of this additional area needs cooling, the planned energy centre will not be able to deliver all the cooling required for the fully developed campus.

With the shortfall projected in cooling capacity, it is necessary to review the overall cooling energy strategy and to set out a coherent plan for the projected future development.

10.02.3 Electrical demand

The current electrical maximum demand is approximately 2MW as reported by CDO. In contrast to the original cooling demand assumptions, the anticipated electrical demands were unduly pessimistic. The occupied buildings are using far less electricity than projected. However there is an increased electrical demand associated directly with the extra cooling capacity. Nevertheless, there is adequate electrical capacity for the original masterplan. A further review will be necessary to assess the impact of the proposed applied research facilities.

10.02.4 Current Projections

This section is primarily concerned with the projected cooling demand, as this will be the constraint on the delivery of future building performance. The engineering department of CDO has supplied a schedule of building areas and measured cooling demand for the currently occupied buildings. This schedule also makes some projection of the cooling demand for future buildings. Analysis of this schedule has highlighted some apparent anomalies in the cooling demands for various buildings which would be expected to have similar use profiles. For example, the Faculty of Pure and Applied Science buildings, FST-01 and FST-02, have estimated loads of 147W/m² and 299W/m² respectively. In addition, the estimated demand for the soon to be completed Sports Hall is 374W/m², which is considered unreasonably high. For this reason the estimated loads for both the present and future sports facilities are excluded from the average calculation which is used to predict the trends. The sports complexes will have a different use profile and the cooling demand will not be coincident with the teaching and administration buildings. Therefore significant diversity would be expected, and an allowance is made in the total load estimates.

For the purposes of this report, the above anomalies have been taken at face value, and projections of future capacity are based on the average watts per square metre of gross building area.

Further analysis has been carried out to check what sort of cooling loads would be expected for these types of buildings. This has confirmed that the average Watts per sq.m (W/m²) used in the projections is a reasonable assumption.

The completed buildings for which data is available are

Building Reference	Description	Gross sq. metres	Estimated Max Cooling Demand (kW)
SBD	Services building	1170	135.0
FST-01	Faculty of pure and applied science	19240	720.0
FST-02	Faculty of pure and applied science	Incl in FST-01 above	1670.0
CTF-01	Common teaching facility	2868	280.0
ADM	University House	10000	820.0
TOTAL		33278	3625

From this schedule, the calculated average cooling load is 108 W/m² based on gross area.

There is 47230 square metres of new building either under construction or at tender stage. On the assumption that these buildings perform in cooling terms in line with the average of the completed buildings, the cooling demand will increase by approximately 5.1MW to 8.7MW in 2011. The next phase projects will add a further 33783 square metres. Once again assuming average figures this will increase the cooling demand by a further 3.6MW, bringing the total to 12.3MW.

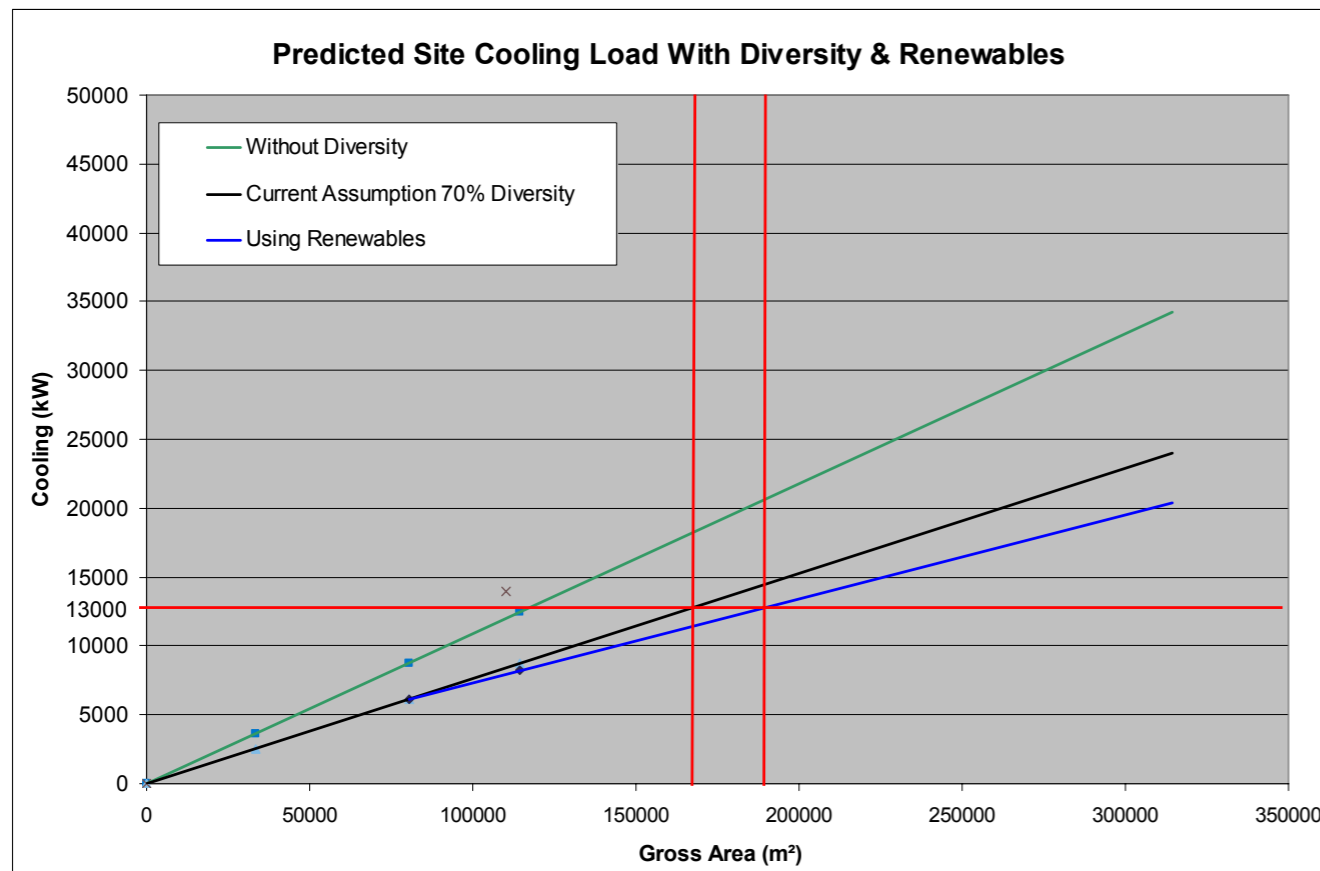
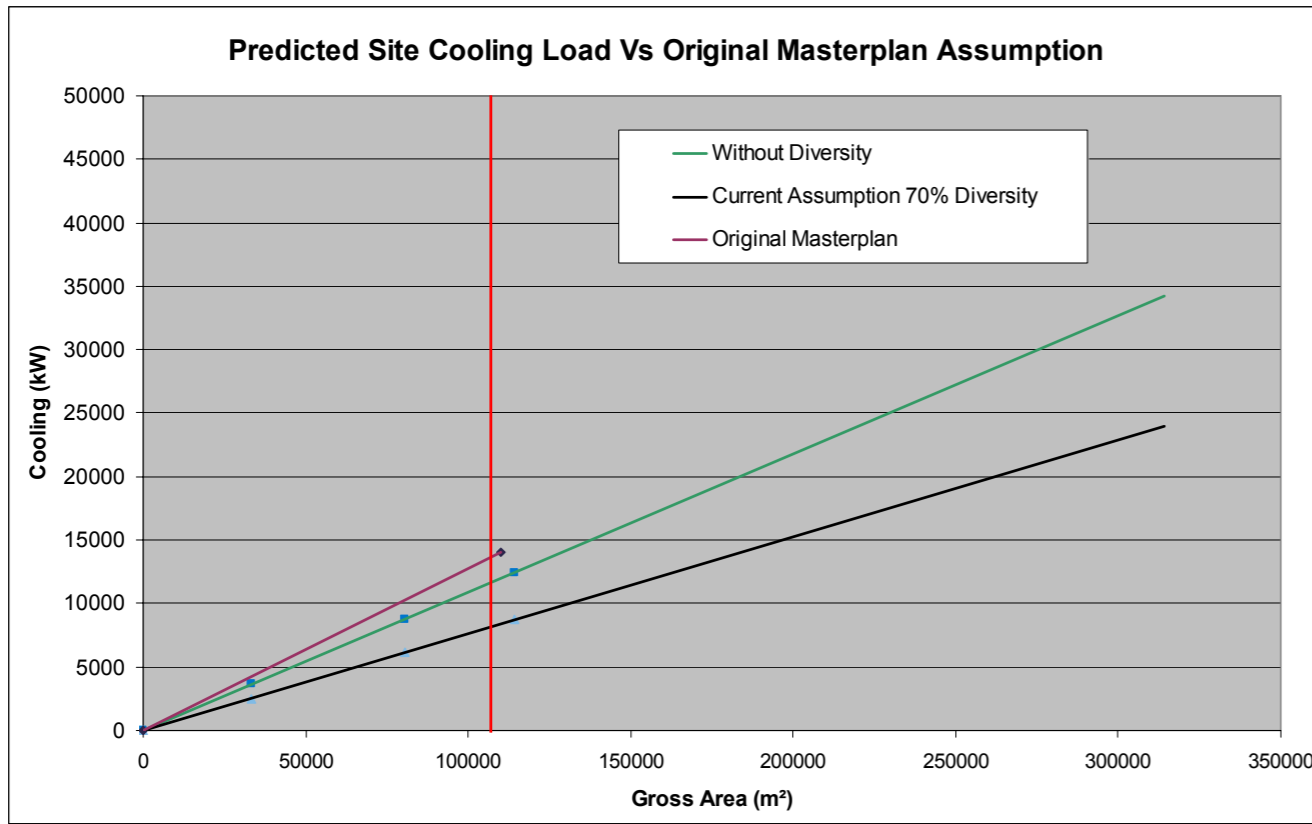
These figures all exclude the projected 1.3MW of cooling for the Sports Centre. However it will have some contribution to the overall load and for the purposes of this assessment, a third of the maximum demand of 1.26MW (ie 0.42 MW) is assumed as co-incident, leading to an estimated total cumulative demand of 12.7MW.

There will be some diversity between the buildings, as peak loads will not occur simultaneously at all buildings. This is because different use patterns result from the academic timetable where not all the buildings are fully occupied all the time. Other factors include physical building characteristics such as orientation, thermal mass, shading and air tightness.

The assessment of the amount of diversity in the system is always a difficult task. One measure that could be applied in this case is to use the measured maximum cooling demand of 2.3MW as advised by CDO. This would give a diversified maximum demand of 69W/m² of gross built area, or 64% diversity, for the buildings already completed and occupied. This figure appears low when bench marked against other air conditioned developments especially considering the high ambient temperatures, but this could be attributed to the fact that the net to gross ratio for the university buildings is lower than that of more commercially used buildings. It should also be noted that this figure is derived from a very small sample of buildings which will eventually comprise the full campus.

For these reasons, it is better to take a slightly more conservative approach to the percentage of diversity. The CDO has suggested a diversity figure of 70% to 75%, and it is agreed that 70% is a reasonable assumption to make at this stage. This results in an estimated cooling demand of approximately 8.9MW after the construction of the next phase projects. Projecting this forward leads to the conclusion that approximately 172 000 m² of gross building could be delivered before the full capacity on the energy centre is reached. This calculation is based on a full capacity of 13MW, rather than 14MW, to allow one chiller to be spare at any one time for maintenance or down time. The project trend is shown in the diagram following.

Projecting this further into the future suggests that for the final campus development a total cooling of 18.4MW. This is estimated on a gross built area of 243 000m², which excludes the residential accommodation. If the residential accommodation is also to be cooled, then a total load of 22.6MW would be expected, based on a total gross area of 300.000m².



10.02.5 Mitigation Measures

There is little that can now be done to improve the performance of the current building stock or the projected performance of those under construction or at tender stage. However, the next phase projects could be designed for better energy performance by requiring lower “U” values for the facades and roof construction, and better detailing and construction to limit infiltration.

These buildings should also be specified to employ renewable energy technologies which will reduce the demand on the centralised cooling plant. A range of alternative energy sources should be investigated and are discussed later in this report.

It is estimated that a target of 25% energy reduction relative to the current buildings is realistic. This would be delivered by a combination of the sustainable and renewable energy options discussed above. If this is applied to the next phase buildings, then this would further delay the need for a second energy centre.

10.02.6 Conclusion

The above analysis demonstrates that the current energy centre can deliver the cooling requirement beyond the “next phase projects”. During the masterplan review, it had been considered that the second energy centre might be part of the new engineering building. This now seems undesirable, and the two projects should be considered separately.

The analysis of future trends is based on a small sample of the buildings, but there will now be time to assemble far better data about building performance. This will lead to more certainty about when the second energy centre will be needed. It is recommended that the CDO put in place a strategy for monitoring the future load growth, and reviewing this as the campus development progresses through the next phases.

10.03 Future Strategy

It is now clear that the originally proposed cooling plant of 14 MW will not be able to deliver all the required cooling for the fully developed masterplan. This is true even without considering the impact of the applied research facilities, residential accommodation and the hotel conference centre. It is therefore necessary to have a revised strategy to enable the further development of the campus and associated facilities.

10.03.1 New Energy Centres

The existing energy centre, when fully implemented, will occupy all the space available at the eastern end of the campus. Therefore a second energy centre will have to be incorporated into the evolving masterplan. The preferred location for this would be towards the western end of the campus, where it would serve the phased development in that area. This would also help to manage the on-going energy costs associated with pumping chilled water from the existing energy centre all the way to the western buildings.

If it is envisaged that the two energy centres would be connected together by extending the “ladder” network of the existing infrastructure. In this way the two centres will share the cooling demand, while also providing resiliency against equipment failure and facilitating routine maintenance. It would be necessary to design the controls and pumping arrangement to optimise the flows in the pipe work, and this would be done as part of the detail design of the new centre.

There may be a need for a further energy centre to pick up the loads for the buildings, in the southern half of the extended campus, as proposed in the enlarged masterplan. This will depend on what the facilities comprise, how they are developed and delivered, funding arrangements, phasing and a host of other interrelated topics. Further study will be needed on this at a later date. However, the masterplan should allow for the possibility of a third energy centre, ideally associated with the hotel conference centre. This would put the three energy centres approximately equidistant from each other at the points of an equilateral triangle.

10.03.2 Phasing and implementation

One of the most important decisions that will have to be made is the timing of when to build the second energy centre. There are a number of scenarios that could be considered here, but the two that seem most appropriate are:

- a) Build out the existing energy centre to its full capacity of 14 MW, thereby delaying the new energy centre as long as possible.

Under the current demand assumptions this would mean that the new energy centre could be delayed until 2016 or 2017, after completion of the “next phase projects”, Biology, Engineering and Common Teaching 3. Infrastructure pipe work from the existing energy centre would be extended as required, and all the additional chillers added in phases to meet the loads of the buildings currently under construction or at tender stage.

- b) Build the second energy centre concurrently with the “next phase projects”, incorporating it with the Engineering buildings.

This energy centre would then deliver cooling to most or all the buildings to the west of the Administration building, and the existing energy centre would retain some spare capacity. This option has the advantage of optimising the water distribution and should deliver reduced overall running costs.

The fact that spare capacity will remain available in the eastern energy centre will allow more flexibility in developing further phases. The applied research facilities could be then phased from both the east and west, depending on the availability of land.

Further study is needed to demonstrate the technical viability of each of these scenarios, and related studies will be necessary to validate the economic case.

10.04 Sustainability and Renewable Energy Options

Sustainability and the use of renewable energy must be incorporated into all future buildings. This will reduce the demand on the central energy plants. The use of ground source heat pumps in conjunction with piled foundations, commonly referred to as energy piles, is becoming a well developed and proven system. When this is used to provide both heating in winter and cooling in summer, it delivers a very economic solution. It is not truly renewable as electrical energy is required to drive the pumps, but with high solar radiation in Cyprus, photo-voltaic cells could be used to supply the electricity for the pumps.

The proposed second lake also provides an opportunity to use water source heat pumps to supplement the energy piles. As this system does raise the temperature of the water in the immediate proximity to the plate exchangers by a degree or two, the ecology of the lake does need to be studied to assess the potential impact of this system.

Other potential sources of renewable energy are solar thermal water heating, solar thermal chillers, photo voltaic cells, wind and possibly combined cooling, heating and power plant (CCHP). Some of the options available are discussed in detail below.

10.4.1 Ground Source Heat Pumps

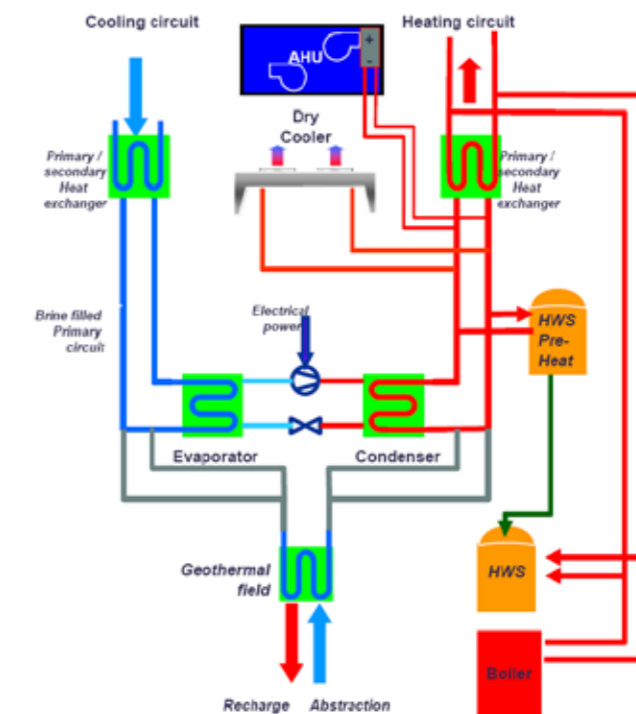
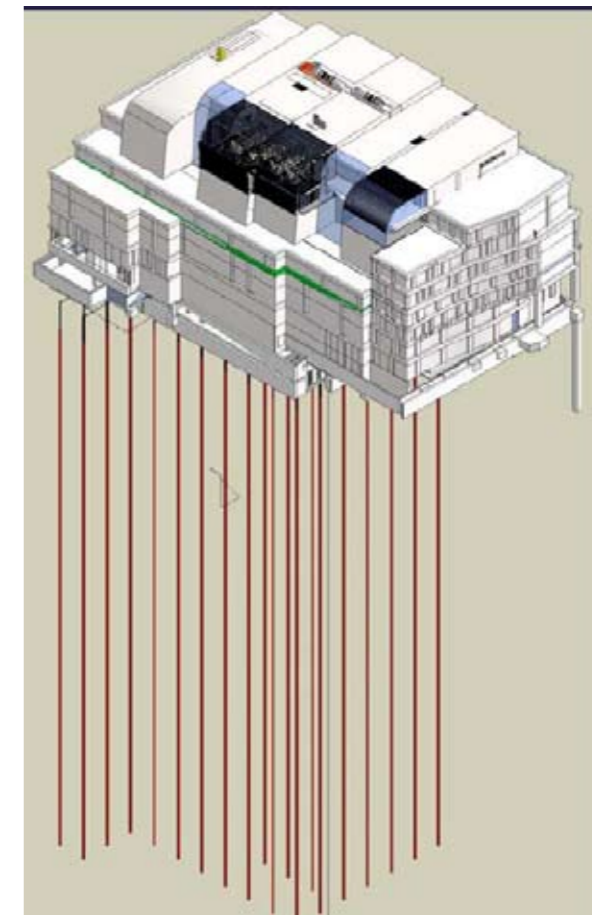
Ground source heat pumps use the refrigeration cycle to take low grade heat from the ground (a renewable resource) and deliver it as higher grade heat to a building. Heat pumps take in heat at a certain temperature and release it at a higher temperature, using the same thermodynamic process as a chiller. As the ground stays at a fairly constant temperature throughout the year, heat pumps can use the ground as the source of heat. The ground temperature is not necessarily higher than ambient air temperature throughout the entire winter but it is more stable.

The technology is very efficient, typically delivering 3-5 units of heat for every 1 unit of electrical power consumed. Limiting factors are the rate at which energy can be drawn out of the ground and the maximum temperatures at which heat can be delivered to the building (typically 50-55oC). The measure of efficiency of a heat pump is given by the Coefficient of Performance (CoP), which is defined as the ratio of the output, divided by quantity of energy put in. Annual seasonal CoPs of 3 or more are achievable with ground sourced heat pump systems, giving good energy and running cost savings.

Whilst a ground sourced heat pump is clearly not a wholly renewable energy source as it uses electricity, the renewable component is considered as the heat extracted from the ground, measured as the difference between the heat output, less the primary electrical energy input.

Typical ground sourced heating systems will use vertical boreholes for installing the piping system.

When considering buildings with piled foundations, the pipes can be integrated in the design using several piling systems.





Energy Piles



Ground Coupled Heat Source

For heating systems, the thermal energy extracted from the ground via the foundation structures is then raised to a higher temperature, suitable for heating purposes by the heat pump. While the average temperature to be found in the concrete foundations is in the region of 12°C, the heat pump increases the temperature between 25°C and 40°C in the heat transfer medium (water or mixture of water and anti-freeze), which is suitable for radiant heating systems such as floor slab or concrete core heating.

These systems can be used for both heating and cooling purposes. The heat transfer medium, which circulates through the integrated piping system is cooled by the ground in the summer and heated in the winter. For cooling systems, water can be introduced directly in the building or if the capacity of the soil is inadequate, a refrigerator unit or a reversible heat pump can be integrated into the system.

When the system is used both for heating and cooling the building, the investment and running costs are particularly economical as the cool ground temperatures can be used at virtually no cost. The energy obtained can be used in conventional air-conditioning systems, low-temperature heating systems, wall, floor and ceiling heating systems and also chilled ceilings.

In the case of piles or other foundation structures, closed circuits of piping are incorporated in the concrete. The piping units are either attached to the reinforcing cages at the factory or on site. The rigged cages are then placed in the locations determined by the structural engineer and cast in the concrete. The individual circuits are subsequently joined up via connecting lines. Pipes are laid primarily in the ground slab and along the exterior face of the outer wall of the building, which is in contact with the soil.

Energy piles can be used in several different structures, depending on the structural engineering requirements of the building and the soil

conditions.

10.4.2 Water Source Heat pumps

A water source system can be either a closed or open loop system, and use ground water or a surface water body such as a lake or river. In a closed loop system, water (or another fluid) is circulated through the water body and passes through a heat exchanger in the heat pump that extracts heat from the fluid. In an open system, water is pumped out of the ground, through the heat exchanger and into a waste water system or discharged directly back to the aquifer. However, this option is much more risky as it depends on the long term availability of the aquifer water supply. The proposed lake would be a more viable option for the university.

10.4.3 Solar Hot water Systems

Solar water heating systems use the energy from the sun to heat water, most commonly for hot water needs. The systems use a heat collector, generally mounted on the roof or a south facing façade in which a fluid is heated by the sun. This fluid is used to heat up water that is stored in either a separate hot water cylinder or more commonly a twin coil hot water cylinder with the second coil providing top up to heating from a conventional boiler. Ideally the collectors should be mounted in a south-facing location, although south-east/south-west will also function successfully. The panels can be bolted onto the roof or walls or integrated into the roof.

There are two standard types of collectors used - flat plate collectors and evacuated tube collectors. The flat plate collector is the predominant type used in solar domestic hot water systems, as they tend to have a lower cost for each unit of energy saved. Evacuated tube collectors are generally more expensive due to a more complex manufacturing process (to achieve the vacuum) but manufacturers generally claim better winter performance.

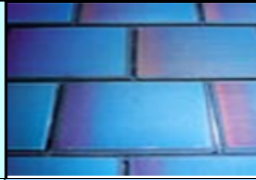
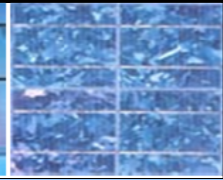
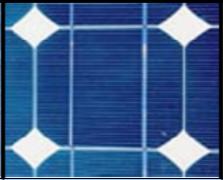
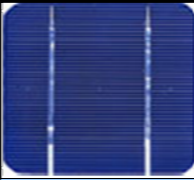


Filsol flat plate system on Wedgewood Visitor Centre (photo courtesy of John Blower), serving washrooms



Viessmann evacuated tube system, London Borough Of Camden (photo courtesy of LB Camden), serving washrooms for office accommodation, library and health centre.

Examples of the two types of solar hot water collectors

	'Thin Film'	Polycrystalline	Monocrystalline	'Hybrid**
Appearance				
Description	The most efficient in poor light conditions. An extremely sturdy, vandal-proof PV.	Also highly efficient in good light conditions. Less embodied energy than monocrystalline.	The most efficient of the PV technologies in good light conditions	A combination of monocrystalline and thin-film technologies this has high peak output coupled with excellent performance in poor light conditions
Efficiency at STC**	Good 7 - 8%	Very good 11 - 13%	Very good 14 - 16%	Excellent 17 - 19%
Efficiency in overcast conditions	Excellent	Good	Good	Excellent
Area needed per kWp***	Kaneka module: 15.5m² Unisolar modules: 18m²	Sharp modules: 8m²	Sharp modules: 7m²	Sanyo modules: 6.5m²
Area needed per kWp	Solar metal roofing: 23.5m² Glass-glass laminate: 25m²	C21 tile: 10m² Glass-glass laminates: 10m² - 30m²	Sunslate: 10m² Glass-glass laminates: 8m² - 30m²	n/a
Annual energy generated per kWp	903 kWh/kWp	750 kWh/kWp	750 kWh/kWp	900 kWh/kWp
Annual energy generated per m ²	55 - 60 kWh/m ²	90 - 95 kWh/m ²	105 - 110 kWh/m ²	125 - 135 kWh/m ²
Annual CO ₂ savings per kWp	393 kg/kWp	325 kg/kWp	325 kg/kWp	390 kg/kWp
Annual CO ₂ savings per m ²	25 kg/m ²	40 kg/m ²	45 kg/m ²	55 - 60 kg/m ²
Annual Carbon savings per m ²	6.8 kgC/m ²	10.90 kgC/m ²	12.27 kgC/m ²	15 - 18.36 kgC/m ²
* Hybrid PV combines both monocrystalline and thin-film silicon to produce cells with the best features of both technologies				
** Standard Test Conditions are: 25 °C, light intensity of 1000W/m ² , air mass = 1.5				
*** kWp = kilowatt peak. Solar PV products and arrays are rated by the power they generate at STC				

10.4.4 Photovoltaics

Photovoltaic (PV) systems convert energy from the sun into electricity through semi conductor cells. Systems consist of semi-conductor cells connected together and mounted into modules. Modules are connected to an inverter to turn their direct current (DC) in to alternating current (AC), which is usable in buildings. PV can supply electricity either to the buildings they are attached to, or when the building demand is insufficient electricity can be exported to the electricity grid.

For PV to work effectively it should ideally face south and at an incline of between 30° and 45° to the horizontal, depending on the latitude of the installation. It is essential that the system is unshaded, as even a small shadow may significantly reduce output.

With the high radiation levels in Cyprus, PV cells could make a valuable contribution to the electrical supply requirement. They could be arranged to supply part of the load of the buildings where they are installed. If opportunities for larger PV cell arrays are identified, then some electricity may be able to be exported back to the grid, which will provide a revenue stream for the university. This could happen during the summer recess when most of the student will be on holiday at a time when peak solar radiation would be expected.

PVs are available in a number of forms including monocrystalline, polycrystalline, amorphous silicon (thin film) or hybrid panels that are mounted on or integrated into the roof or facades of buildings. The table below from PV supplier Solar Century shows carbon savings per metre squared or output of panel for all the various forms, which is useful for comparing the various PV technologies currently available.

10.4.5 Wind Energy

Wind energy can be one of the most cost effective methods of renewable power generation. Wind turbines can produce electricity without carbon dioxide emissions ranging from Watts to MegaWatt outputs.

a) Standalone turbines

Large scale, modern and quiet wind turbines are becoming viable in suburban areas, where ease of maintenance and immediate connection to grid or directly for use in a building, may make them cost effective, despite lower wind speeds than in open areas. Wind turbines are generally less suited to dense urban areas as their output will be affected by potentially lower and more disrupted wind speeds, and the use of larger more cost effective machines may be prohibited by their proximity to some building types.


Larger wind turbines mounted on the ground are also an option, but careful study is needed in siting them. The wind density of the site also needs to be determined to assess their viability, where average wind speeds of above 6km/hr throughout the year is currently considered the benchmark. They should generally be at least 3000m for any occupied buildings to avoid flicker at low sun angles.

b) Building integrated wind turbines

Small turbines of 1 to 2.5 kW can also be mounted on buildings and whilst there are currently few practical implementations of building mounted wind turbines, this technology is rapidly improving and is likely to become fairly common in the next five years, as several manufacturers are gearing up for mass production. These products achieve relatively good carbon savings compared to their cost.

The technical characteristics, energy output and costs of some examples of building integrated turbines are given in the table below left.

The small scale or micro turbines have a diameter of around two metres and require mounting on a pole which increases the turbine overall height to at least 4m. Turbines would be mounted on the roof of the teaching blocks or office building, as the increased height would mean greater wind speeds.

Wind Energy Options	Building Mounted		
Manufacturer	Renewable devices – Swift turbine	Windsave – Plug 'n' Save WS1000	Proven
Indicative image of the system type			
Contact	www.renewabledevices.com	www.windsave.com	www.provenenergy.com
Output	1.5 kW	1.0 kW	2.5kW
Turbine diameter	2.00m	1.75m	3.5m
Capital cost per turbine	£8500** installed	£1300*** installed	£14,000 installed
Annual energy saving	3,500 kWh*	2,500 kWh*	4282 kWh*
Annual carbon saving	395.5 kgC	282.5 kgC	484kgC
Cost per kgC saved	£21.49	£4.60	£28.90

10.05 Implementation of Energy Efficiency Legislation in Cyprus.

There is now a law in place in Cyprus implementing the directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings. The Law N. 142(I)2006 came into force on 23 December 2007 and dictates, among other things, that all new building permit applications shall have to meet the minimum criteria for elemental U-values as follows:

- External walls: $U \leq 0.87 \text{ W/m}^2 \text{ K}$
- Roof and exposed floors: $U \leq 0.75 \text{ W/m}^2 \text{ K}$
- Openings: $U \leq 3.80 \text{ W/m}^2 \text{ K}$
- Walls to unheated spaces: $U \leq 2.00 \text{ W/m}^2 \text{ K}$

The above U-values are valid for the time being but they are subject to periodic reviews and revisions as needed and they need to be reviewed at least every five years.

Thermal insulation is required to wrap around the entire building envelope in order to control thermal bridging. Therefore, cavity infill insulation on wall sections between columns, a typical practise in Cyprus, is no longer allowed.

At the moment for building permit purposes only elemental U-values must be checked and the minimum criteria met. An Excel spreadsheet for the purpose is available at the website of the Cyprus Energy Institute (CIE).

A new software is under development and is expected to be released at the end of 2008. The new software will combine residential and non-residential building analysis and will be able to issue an energy certificate as well. Energy certification procedures will be in place by the end of the year and implementation starting from the beginning of 2009. Certification for existing buildings ($\geq 1000 \text{ m}^2$) will commence together with new building certification. Otherwise, existing smaller buildings will need a certificate only when sold or rented.

In the context of the University, all new facilities must be certified and it would be wise to aim for the highest energy performance class in view of the leading role of universities as environmentally conscious enterprises.

10.05.1 Introducing renewable energy in the energy mix of Cyprus and the related legislation

Introduction of renewable energy into the energy mix of Cyprus is stipulated in the law N.122(I)/2003 'Law regulating the electricity market of 2003'. The above law is based on the directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity.

The above law opened up the electricity generation market for competition and ended the monopoly of the Electricity Authority of Cyprus. It also establishes the Cyprus Energy Regulatory Authority CERA, whose duties include, among other things, approval of applications for electricity generation, such as wind parks for example.

It is now possible for third parties to apply for a licence to generate and sell electricity. In the context of the University, Section 35 of the law in particular is of interest because it stipulates the requirements for exemptions from authorisation to energy generation activities for applications of self generation of electricity, power not exceeding 1 MW capacity, and the generation of electricity from renewable energy sources not exceeding 5 MW capacity. Therefore, it appears that the University is eligible for a self generation exemption permit. Subsequently, the University has already applied for an exemption permit for 250 kW wind turbine (application dated 14.5.2008).

The Cyprus Institute of Energy, together with all other relevant stakeholders have prepared an Action Plan for the promotion of renewable energy sources in Cyprus in 2002-2010 and the main objectives of the Action Plan are:

- a) doubling the contribution of RES in the Cyprus energy balance ($\sim 4\%$ in 2006 to 9% in 2010)
- b) increasing the contribution of electricity generated from RES from 0% to 6% of the total electricity consumption in 2010.

Wind energy is expected to take the lead in renewable electricity production (projection for 2010: $\sim 4.5\%$ of total electricity generation). By May 2008, 59 applications had been filed for wind parks, totalling 2.07 GW. 37 applications had been approved by March 2008 (total of 1.43 GW). In view of the fact that the current power generation capacity on the island is 988 MW, the percentage of approved wind park applications is rather high. It is expected though that not all approved licences will be utilised immediately (or possibly ever). About 30% wind generation is expected to be sustainable from the grid operation point of view. No wind parks are under construction at the moment but a few are close to getting started. Therefore, meeting the target of 2010 in terms of electricity generation from renewable sources is yet questionable. New Action Plan for 2010-2020 is currently under preparation.

Photovoltaic installations are rapidly penetrating the market and it is estimated that new installations are made at a rate of 6-7% monthly increase. In April 2008 there were over 1MW of grid connected and about 700kW stand-alone PV installations in place. Special EU funding has been allocated for installing PV at schools in Cyprus. It might be useful to investigate if the University qualifies for such special funding. In any case, the University qualifies for the regular grant schemes for subsidies for PV installations that at the moment provide for:

- a) 40% subsidy on capital investments + 0.205/kWh produced for 15 years or
- b) 0% subsidy on capital investments + 0.386/kWh produced for 15 years

At the moment, the subsidy covers maximum of 20 kWp installations but is expected to be increased to 100 kWp soon.

Regarding biological fuels, the following forms are considered on the island: biomass, landfill gas, sewage treatment plant gas and biogases. Applications are already in place utilising olive pit residue (a by-product from olive oil mills) that can be used in boiler burners. Permit applications are also pending for electricity generation from sewage gas. Energy crop growing is not feasible due to water problems. Agricultural residues available from farms however have unexploited energy potential.

10.06 Climate Change Issues in Cyprus

The climate change projections for the Mediterranean region laid out in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) published in 2007, especially the work by Working Group II, indicate that temperature increases up to 7.07°C are to be expected by the end of the century. Furthermore, specific observations in Cyprus indicate a 1°C increase inland and 1.3°C increase on the coast in the annual mean temperatures over the 21st century, about twice the observed globally averaged warming as reported by the IPCC. In addition, the diurnal temperature range has been reduced by 0.5°C inland and 3.5°C on the coast. The reduction in diurnal temperature range reduces the night cooling potential of buildings.

Meteorological statistics for rainfall precipitation indicate that the long term trend line of 30-year moving averages has been reduced from 583 mm in 1902 to 465 mm in 2001, indicating a reduction of more than 1 mm a year. A 40% reduction on average in the inflow to the island's dams compared to the assumptions based on pre-1970 records has been reported. Subsequently, the island is suffering from chronic water shortages. Although the hydrometeorological year 2007-2008 is considered as a draught year, nevertheless it is expected that the current trend of diminishing rainfall will continue into the future and is a part of larger changes in the climate. In any case, the IPCC predictions confirm increased water stress in the Mediterranean basin during the 21st century.

SECTION 10 - APPENDIX**Relevant laws in Cyprus regarding energy efficiency improvements and the utilisation of renewable energy****1. N. 122(I)/2003 Law regulating the electricity market of 2003**

- The above law is based on the Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC.

- The above law opened up the electricity generation market for competition and ended the monopoly of the Electricity Authority of Cyprus. It also establishes the Cyprus Energy Regulatory Authority CERA, whose duties include among other things approval of applications for electricity generation, promotion of the security, safety, continuity, quality, and reliability of supplies of electricity, promotion of renewable energy, safeguarding effective competition in the electricity market, protection of the interests of consumers, etc.

- Also, the law dictates the establishment of Transmission System Operator who shall be an independent entity and shall not engage in the generation, distribution or supply of electricity. Cooperation between the Transmission System Owner (EAC) and the TSO is also specified in the law; i.e. the Owner is obliged to provide the necessary support and infrastructure for the Operator to carry out its duties but the Operator shall not direct or instruct the Owner in any way.

2. N. 33(I)/2003 Law regarding the promotion of the use of renewable energy sources and general energy efficiency measures, establishing a special fund for subsidising or financing the above, and other related matters

- This law establishes a special fund for subsidies to be available for building energy efficiency improvements and introduction of renewable energy systems.

- It also establishes a 'green levy' of 0.13 CY cents/kWh (0.22 ¢ cents/kWh) to be charged from all customers of the Electricity Authority of Cyprus. The funds from the green levy are to be used in the subsidy programs specified by this law.

- It is estimated that more than CY£42 million (72 million Euros) will be collected by the year 2010 from the green levy.

3. N. 234A(I)/2004 Law modifying the law of 2003 on promoting the use of renewable energy sources and general energy efficiency measures

- This law modifies the law N. 33(I)/2003 Article 7, Section (3) by making changes in the rules of how to manage the fund.

4. N. 139(I)/2005 Law modifying the law on promoting the use of renewable energy sources and general energy efficiency measures

- This law modifies the law N. 33(I)/2003 Article 7, Section (3) by making changes in the rules of how to manage the fund and allowing

activities other than electricity generation to be included under the grants scheme (wall & roof insulation etc.).

5. N. 140(I)/2005 Law about environmental impact assessment in several different laws and their assorted articles

This law sets up the requirements for environmental impact assessment studies and gives examples for what type of projects are required and what detailed information the studies should include.

6. N. 162(I)/2006 Law modifying the law on promoting the use of renewable energy sources and general energy efficiency measures

This law is based on the Directive 2001/77/EC of the European Parliament and of the Council of September 27 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market.

It modifies the basic law N. 33(I)/2003 by adding new articles that further define the scope that the special fund for promoting electricity production using renewable energy sources can be used and the role of CERA in approving the licensing applications.

7. N. 142(I)/2006 Law regulating the energy performance of buildings

This law is based on the directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings and incorporates the directive into the national legislation.

8. Harmonizing actions 429/2006 regarding the law on streets and buildings

This set of rules introduces the terminology from the Law regulating the energy performance of buildings (N. 142(I)/2006) and relates the new energy performance requirements in the context of the streets and buildings law.

Also, the requirement for techno-environmental-economic studies for all new buildings >1000m² is stipulated.

9. Order No. 2 of 2006 on the law regarding town planning and land rule

This order defines the role of the town planning department in the context of approving application for power generation facilities using renewable energy (such as wind parks or single turbine installations).

Criteria such as maximum allowable noise, maximum height of turbines, minimum distances between wind parks etc. are specified in this order.

11.00 TRAFFIC AND TRANSPORT REPORT

Building on Success
 Transport Report for the Review of the University Masterplan

Report for University of Cyprus
 In Association With YRM
 November 2008

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Summary

In August 1994 MVA provided a report on the transport element of the University Masterplan. Since then much of the development envisaged in that masterplan has taken place and the new University Campus at Athalassa has been successfully established.

In this Report we have reviewed the current traffic context around the University campus at Athalassa and the current demand for transport movement. We have then assessed the transport demand generated by the forecast long-term growth of the University and recommended policies to respond to this predicted demand.

The Base Forecast Case is for the University to expand up to some 10132 staff and students of whom 9338 are typically present on the Campus rather than at other University locations. There would be some 1565 student residences on Campus.

There are two further development options. These options assume that there is a political settlement and that the Buffer Zone can be used for continuing University expansion. One option is to use this land to create a Research Park with some 2490 employed staff. A second option is to use the land to expand the University up to some 15,500 staff and students (approximately 13,000 students and 2,500 staff) and to provide 2,000 residences for students on the Campus. These options may not be mutually exclusive.

The future layout of the University should continue to follow the existing masterplan with its emphasis on Providing a Campus design that follows urban design principles that retain a sense of "place" as well as providing for travel movements:

- restricting use of the roadway through the centre of the Campus to service and emergency vehicles and to construction vehicles when essential and providing several crossing points for pedestrians with restricted allowable speeds on this roadway assisted by traffic calming measures;
- keeping all staff, student and visitor traffic on the local Campus distributor road and only providing parking spaces accessed from this road; and
- ensuring that staff and students can freely walk and cycle around the Campus by providing legible routes through building layouts designed with walk/cycle permeability.

The social climate associated with the unconstrained use of the car for travel to work or study is changing. The preparation and implementation of a Travel Plan for the University is an appropriate response to the transport demands placed on the University by the Base Forecast Case and the two development options.

The Travel Plan will contain a number of practical policies and measures as a response to the objectives set by the University. There will be targets for achieving these objectives, including a target to reduce the percentage of travel as car driver to and from the University.

To be successful, a Travel Plan for the University of Cyprus will need to have the support of staff and students. There is then a need for creating awareness amongst staff and students of the social, economic and environmental issues associated with car travel. This requires an on-going communication campaign with appropriate resources. The travel plan will need to achieve a change in travel behaviour by staff and students if its targets are to be reached.

There will be a need for a set of "carrots" to encourage the desired travel behaviour and a set of "sticks" to deter undesirable travel behaviour.

A successful Travel Plan will reduce the need for transport and parking infrastructure but inevitably some financial resourcing of infrastructure will be needed.

For the Base Forecast Case it will be necessary to provide:

- more car parking spaces accessed from the Campus Distributor road;
- review the operation of the northern access formed by a direct link from this Distributor road onto the realigned Geri-Aglangia Road and possible need for controls on use of this access;
- review the operation of the western access (at a roundabout onto the Geri-Aglangia Road) and the eastern access onto the Old Larnaka Road and the need for traffic management or infrastructure improvements to improve the capacity of these accesses; and
- complete the southern section of the Campus Distributor road.

For the two development options both require a political settlement and use of the Buffer Zone. They involve the creation of a Research Park and/or the expansion of the University to 13,000 students and it will be necessary to provide:

- further car parking spaces accessed from the Campus Distributor road;
- provide car parking spaces in the Buffer Zone;
- further review the operation of the western access (at a roundabout onto the Geri-Aglangia Road) and the eastern access onto the Old Larnaka Road and the need for traffic management or infrastructure improvements to improve the capacity of these accesses; and
- provide new accesses from the Buffer Zone onto Old Larnaka Road (with an upgrade of its capacity) and onto an extended Kalamon Road.

1 Introduction

1.1 Background

- 1.1.1 In August 1994 MVA provided a report on the transport element of the University Masterplan. Since then much of the development envisaged in that masterplan has taken place and the new University Campus at Athalassa has been successfully established.
- 1.1.2 With this success has come a demand for expansion of University facilities above those anticipated in the original masterplan. This report reviews current transport and parking information at the University, and investigates the transport implications of the proposed expansion of the University. The report then recommends an approach to meet transport needs and to minimise negative transport impacts on the local road network and environment.
- 1.1.3 The main University campus at Athalassa is shown in Figure 1.1 with planned new buildings shown. The University Academia site remains in use and there are buildings in university use in the Walled City, at Latsia and at Strovolos. As the planned new buildings are commissioned and occupied, the expectation is that the buildings in Latsia and Strovolos will be vacated but the Academia and Walled City sites will be retained for university use.

1.2 Terms of Reference

- 1.2.1 Our terms of reference are to review the current traffic context around the University campus at Athalassa and the current demand for transport movement. We are then to assess the transport demand generated by the forecast long-term growth of the University and to recommend policies to respond to this predicted demand.

1.3 Information Sources

- 1.3.1 Information for this report has been provided by sources within the University including Agis Elisseos and Stelios Achiotis and their colleagues Akis Sophromiou, Evis Drousiotis, Athos Chrysanthou, Simon Christodolou, Philippos Ioannou and Christina Sierepekli.
- 1.3.2 We have also had the opportunity to meet and obtain information from Yiannis Hadjiosif and Thrasos Aphas of the Public Works Department and to obtain documents from the Town Planning Department.

1.4 Report Layout

- 1.4.1 This report sets out our findings in the order indicated in the terms of reference. Chapter 2 describes the current transport context and demand for travel to the University. In Chapter 3 we take the forecast increase in staff and students associated with the long-term development of the University and estimate the future long-term demand for travel.
- 1.4.2 In Chapter 4 we provide our recommendations on policies and measures to manage the increased demand for travel and for parking on the campus.



Based on the 1:1250 scale Ordnance Survey maps with the permission of the Controller of Her Majesty's Stationery Office. © Crown Copyright reserved

<h1>University of Cyprus</h1>		Title Masterplan		No. Date Revision	
Project No. -	Figure No./Drawing No. Figure 1.1	Scale NTS	Rev No. -	Drawn Designed - Approved -	SW -
Prepared June 2008					

2 Current Development and Transport Context

2.1 Progress in implementing the masterplan

2.1.1 The basic physical layout for the University has been implemented in line with the original masterplan as set out in the Traffic Report for the Masterplan dated August 1994.

University Development

2.1.2 Table 2.1 shows the forecast staff and students numbers as identified in the 1994 masterplan and the actual numbers according to University records for the period 2007/8 both in total and typically present on an average weekday at the Campus.

Table 2.1 University statistics

Staff and Students	Masterplan forecast	2007/8 total	2007/8 present on Campus
Students	4290	5427	1502
Administrative staff	290	442	220
Academic staff	440	720	199
Other workers (outsourced staffing and construction staff)	-	70	70
Number of residences (students resident on Campus)	1130	208	208

2.1.3 The actual numbers of University staff and students in 2007/8 are greater than forecast in the masterplan but most are still based on existing sites at Academia, Latsia and Strovolos instead of on the Athalassa Campus as had been forecast. One student residence has been built just to the north of the realigned Geri-Aglangia Road and none in the southern sector of the Campus.

Road Layout

2.1.4 The road layout shown in figure 4.5 of that report has been completed with the exception of:

- the improvement to the Geri-Aglangia Road and its revised realigned routing to connect with the Old Larnaka Road; and
- the completion of a road link around the southern half of the Campus, and avoiding the Buffer Zone, to serve residential accommodation for students.

2.1.5 Both of these roads are shown in Figure 1.1. The improvement to the Geri-Aglangia Road and its realignment is now under construction. The road link around the southern half of the Campus has not been needed as the student accommodation planned for this area has not as yet been in built.

2.1.6 At the time of the Traffic report in 1994, several other road improvements near to the Campus were planned (refer to Section 4.2 of that report and included as Appendix B). These improvements are now listed together with comments on progress in their implementation in paragraphs 2.1.7 and 2.1.8:

- upgrading of the Athalassa Forest Road. perhaps to dual carriageway standard, realignment and extension of this road to skirt the southern boundary of the Campus site and an improved all-movements junction with Limassol Avenue;
- new primary distributor road, known as the Kalamon Road, between Limassol Avenue and the Geri-Aglangia aligned south of the Athalassa Forest; and
- widening of the Old Larnaka Road to provide four-lane highway with improvements to signalised junctions through Aglangia.

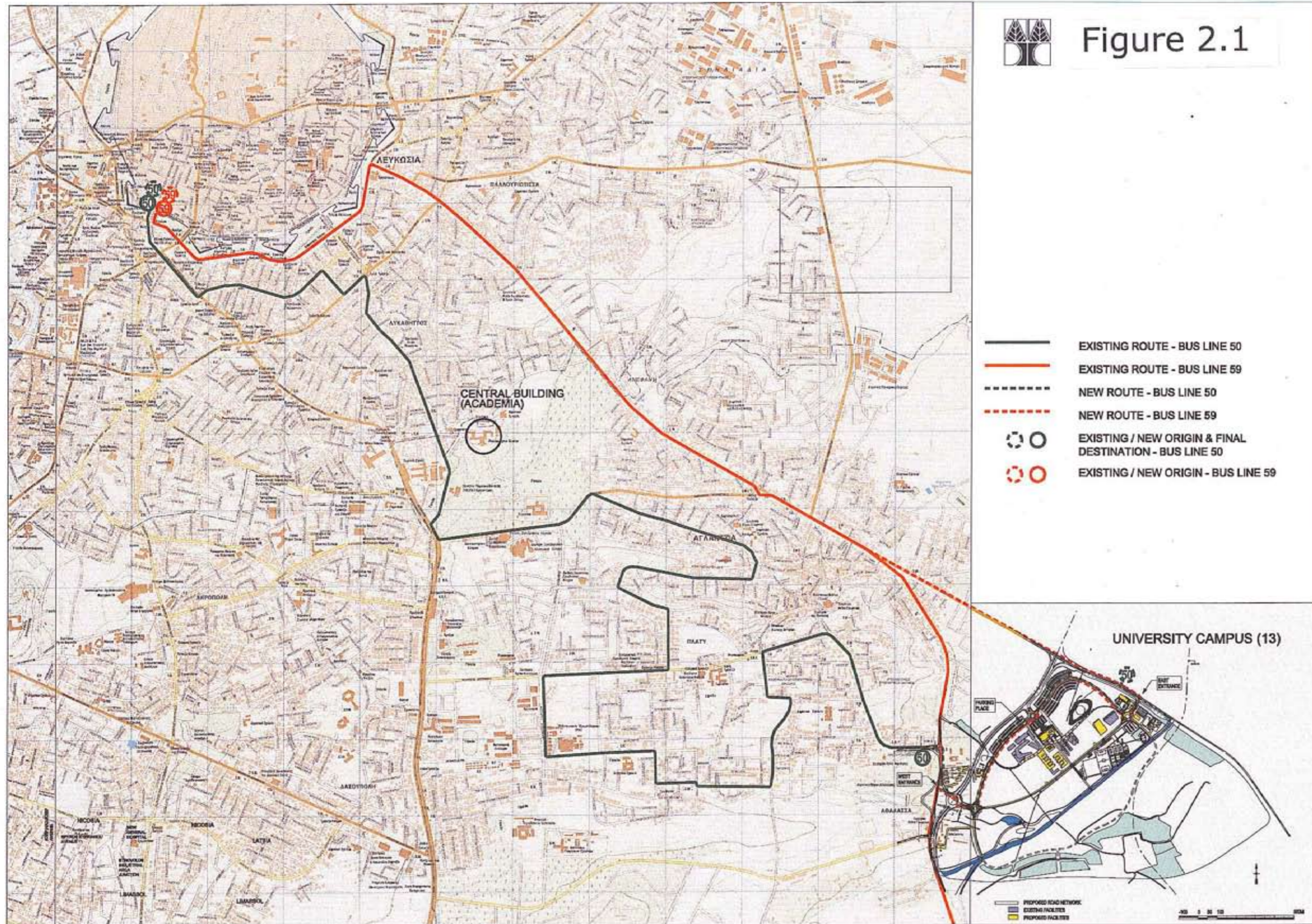
2.1.7 Environmental concerns have been the reasons why the Athalassa Forest Road has not been improved. However, the new primary distributor Kalamon Road has been built, initially mostly as a single carriageway but to a high design standard. A signalised junction has been provided at a new junction with the Geri-Aglangia Road. This means that there is now a high-capacity link between the Geri-Aglangia Road and both Limassol Avenue and the Nicosia-Larnaka motorway and this provides good access to the Campus from the southern area of the city and from Larnaka and Limassol. It would be the Kalamon Road rather than the Athalassa Forest Road that could be extended in the future to skirt the southern boundary of the Campus.

2.1.8 The widening of the roadway through Aglangia has not been implemented but we understand from PWD that this widening is actively being considered by the Town Planning Department. Traffic levels through Aglangia have clearly increased considerably since 1994 and congestion occurs at peak periods. Activity at the Campus contributes to a certain extent to this congestion but the traffic movements to the Campus in the morning and away from the Campus in the afternoon/evening are in the opposite direction to the peak traffic flow to Nicosia city centre in the morning and away from the City Centre in the afternoon/evening.

Pedestrian and Cyclist Routes

2.1.9 The Campus itself has a well-developed pedestrian network of routes though the implementation is slightly different to that envisaged in the 1994 masterplan with the Belvedere pedestrian route around the north-eastern arc of the site having a slightly different alignment to that originally proposed. Pedestrian crossings of the central service route as well as the northern distributor road have been provided. Grade-separated pedestrian crossings of the realigned Geri-Aglangia Road are being constructed to link with the nearby Keryneias Avenue.

2.1.10 Keryneias Avenue has been provided with a cycle route, separated from the roadway by a kerb, and this is also linked by the grade-separated crossing of the Geri-Aglangia Road to the Campus. Our observations suggest that cyclist movements on Keryneias Avenue and on the Campus are rare events. Much of the cycle route is blocked by parked vehicles.



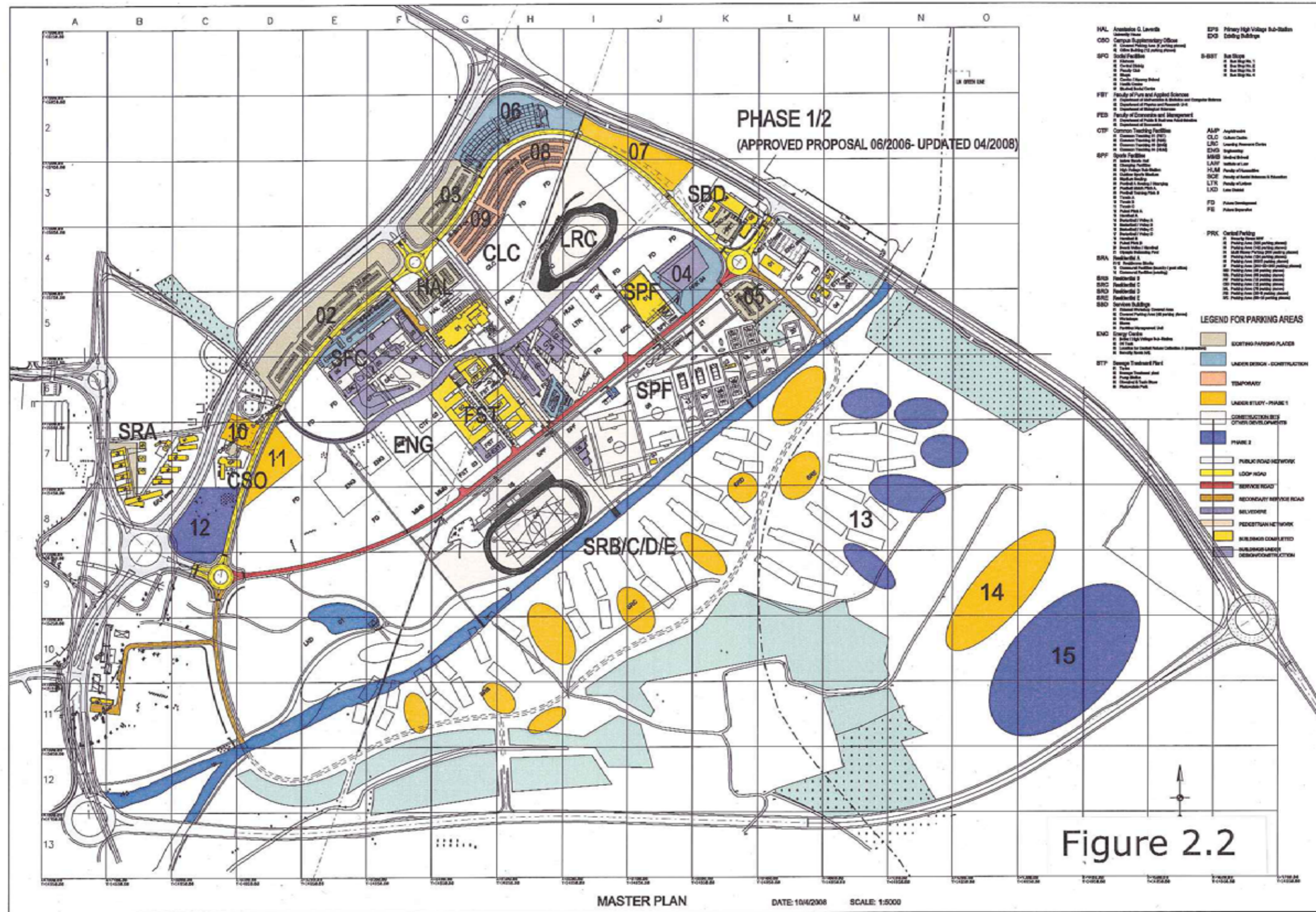


Figure 2.2

Public Transport

2.1.11 Bus services have been provided to the Campus and have successfully attracted patronage. These services are:

- Route 50 between the City centre and the Campus passes close by the Academia site and takes a circular route through residential areas of Aglangia;
- Route 59 takes a direct from the City Centre to the Campus along Larnakos Road; and
- Services between the Latsia and Strovolos sites and the Campus.

2.1.12 Routes for services 50 and 59 are shown in Figure 2.1.

Parking

2.1.13 The 1994 masterplan proposed 1700 car parking spaces and 300 motorbike spaces for the Campus excluding that needed for student accommodation. 500 car parking spaces and 200 motorbike spaces were proposed for the student residential development. Since 1994, the numbers of two wheeled vehicles (motorbikes and motor scooters) used by students has declined dramatically with the great majority of students preferring car to motorbike travel.

2.1.14 Figure 2.2 shows parking areas on the Campus. Appendix A shows the revised masterplan with construction proposed to beyond 2015 together with the associated parking proposals.

2.1.15 On campus there are currently some 653 permanent car parking spaces and some 500 temporary parking spaces on land not yet built on. There are also some 68 parking spaces at the student’s residence.

2.1.16 Some parking has been provided directly accessed from the central service road. This does not accord with the masterplan principle that all parking should be accessed from the Campus Distributor Road so as to minimise the numbers of traffic movements on the service road and to minimise the resultant conflict with pedestrian movements

2.2 Future Transport Plans

2.2.1 PWD advise that:

- there are plans to widen the whole of Kalamon Road to four lanes and this will form part of an orbital route linking to the Nicosia-Larnaka motorway;
- grade separation schemes are being studied for Limassol Avenue at its junctions with both Aglangias Avenue and Athallasa Forest Road;
- the widening of Larnakos Road and Aglangias Avenue to four lanes is being considered by the Town Planning Department. This is a long-standing improvement scheme included in the Local Plan. The widened road would have a 50 kph speed limit and its junction with Ammochostou in Aglangia is planned to be converted from signalised control to a roundabout;
- a new junction is to be provided on the Nicosia-Larnaka motorway at the Stadium and the motorway north of this junction then widened to six lanes; and
- a Public Transport Mobility study for Nicosia is to be commissioned by PWD; only 2-3% of journeys in Nicosia are made by public transport.

2.2.2 Figure 2.3 shows a long-term road network for the city.

2.3 Existing Recent Survey Information

2.3.1 A traffic survey was undertaken by University staff over one week between 9am and 11am in October 2007 of traffic entering and leaving the Campus at the western entrance (Geri-Aglangia Road) and the eastern entrance (Old Larnaka Road). The results are in table 2.2.

2.3.2 A further traffic survey was undertaken in May 2008 of traffic on the Geri-Aglangia Road, immediately north of the entrance to the Campus, on a weekday between 7am and 9am and between 3pm and 5pm. The results are in Table 2.3.

Table 2.2 Traffic entering and leaving the Campus between 9am and 11am

Entrance	9/10/07	10/10/07	11/10/07	12/10/07	15/10/07	Average
Western	294	242	199	114	182	206
Eastern	211	187	165	84	118	153

2.3.3 Average peak hour vehicle arrivals between 9am and 11am are then around 180 per hour at present.

Table 2.3 Traffic on Geri-Aglangia Road

Time	Direction	Cars	Buses	Lorries	M/cycles	Total vehicles
7am-8am	Northbound	887	5	60	12	964
	Southbound	894	7	48	18	967
8am-9am	Northbound	516	6	73	10	605
	Southbound	506	9	66	14	595
3pm-4pm	Northbound	651	10	49	13	723
	Southbound	825	3	29	8	865
4pm-5pm	Northbound	834	4	54	8	900
	Southbound	829	5	9	7	850

2.3.4 A survey of student residences in Nicosia was completed in March 2008. The results as numbers of students in each street link are shown as Figures 2.4 and 2.5.

2.3.5 A travel survey of students and staff travel behaviour has been completed and is described in section 3.2.

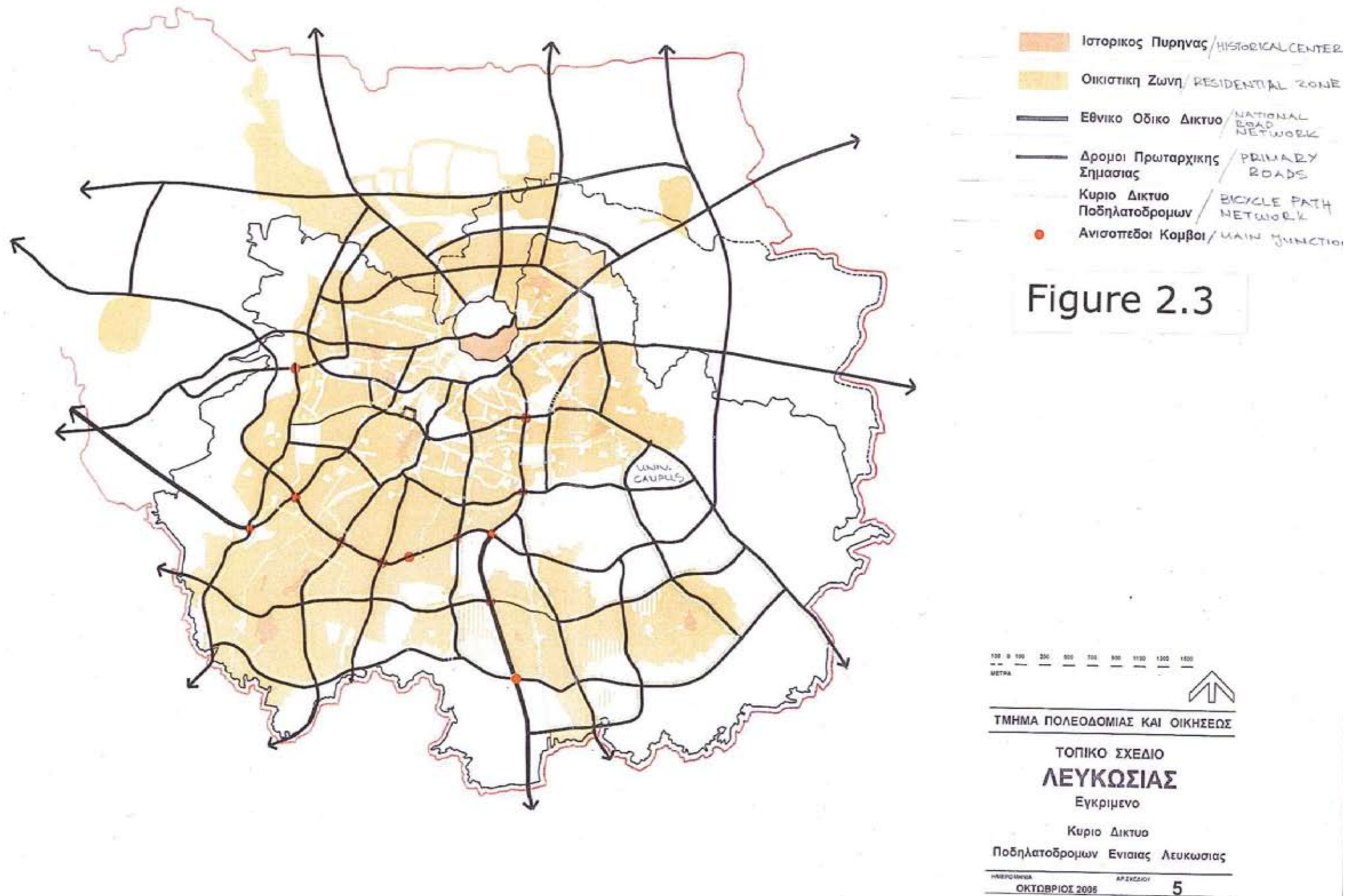
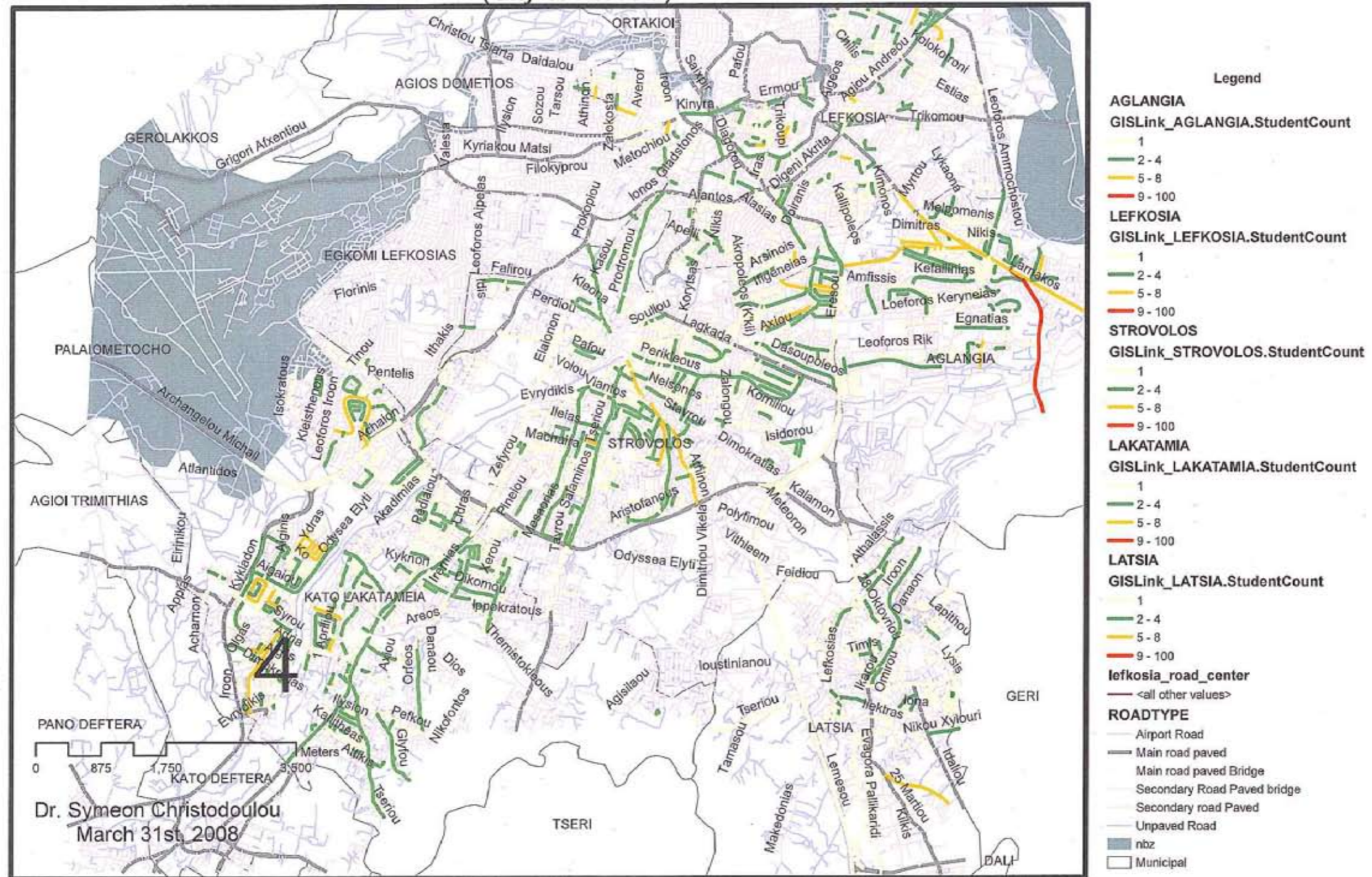


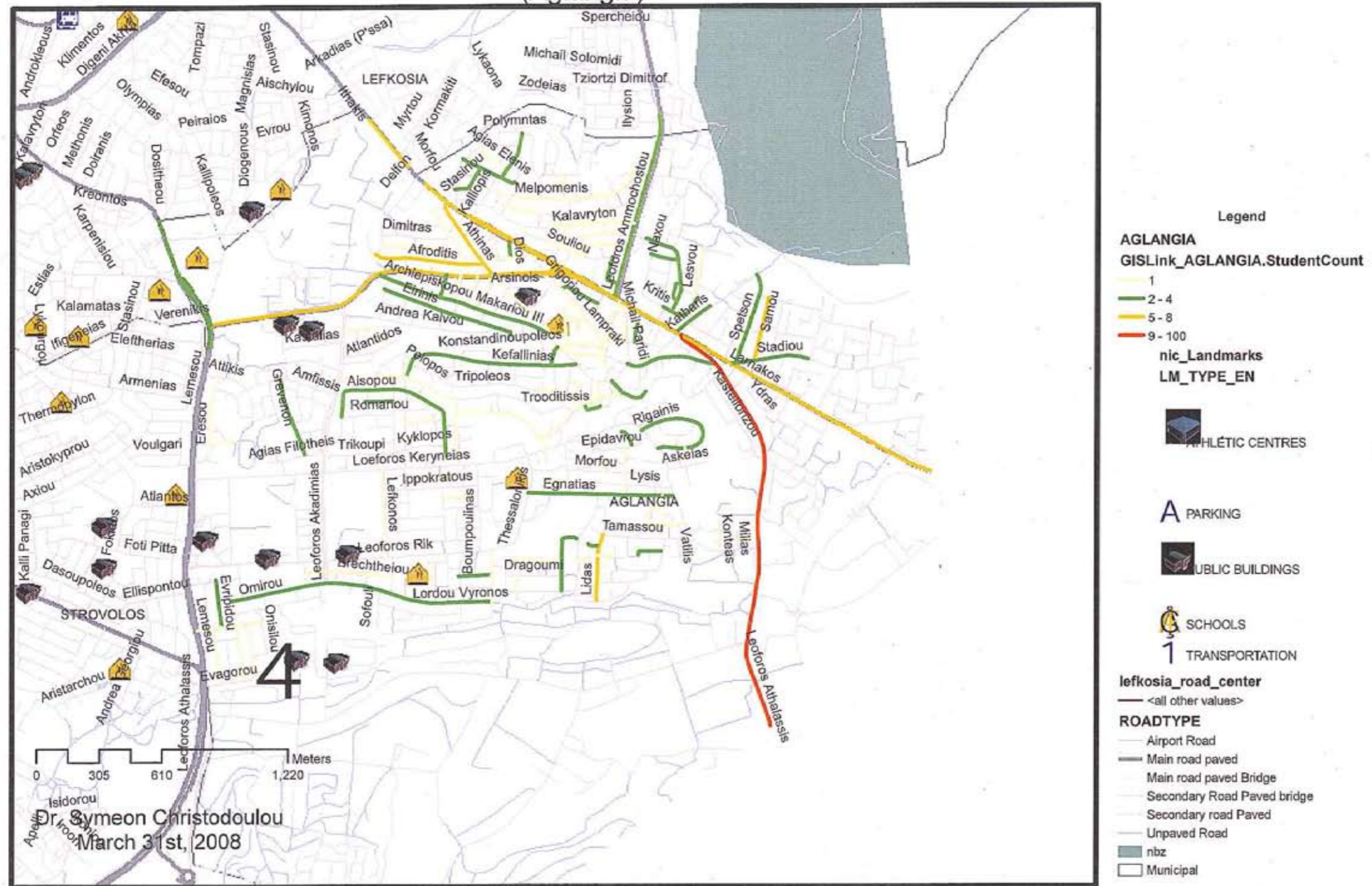
Figure 2.4

UCY's Student Population Residency
(City of Nicosia)



UCY's Student Population Residency
(Aglangia)

Figure 2.5



3 Transport Demand for Future University Development

3.1 University Forecasts

3.1.1 The University has provided the forecasts for year 2020 as shown in table 3.1 as a basis for reviewing the masterplan.

Table 3.1 University Forecast Statistics

Staff and students	2007/8 total	2007/08 present on Campus	2020 total	2020 present on Campus
Students	5427	1502	8444	7782
Administrative staff	442	220	844	778
Academic staff	720	199	844	778
TOTAL Staff and Students	6589	1921	10132	9338
Other workers (outsourced staff)	70	70	50	50
Number of residences (students resident on Campus)	208	208	1565	1565
Research Park staff			2490	2490

3.1.2 The intention would be to close the Latsia and Strovolos sites in the near future and to reduce the scale of the Academia site whilst having some students and staff in the Walled City Centre. Part of the southern area of the Campus including the Buffer Zone would be occupied by student residences and part by a Research Park.

3.1.3 The University forecast statistics can be translated into a Base Forecast Case and a set of Planning Options.

Base Forecast Case

3.1.4 The Base Forecast Case is for the University to expand up to some 10132 staff and students of whom 9338 are typically present on the Campus rather than at other University locations. There would be some 1565 student residences on Campus.

Options

3.1.5 The options assume that there is a political settlement and that the Buffer Zone can be used for continuing University expansion. One option is to use this land to create a Research Park with some 2490 employed staff. A second option is to use the land to expand the University up to some 15,500 staff and students (approximately 13,000 students and 2,500 staff) and to provide 2,000 residences for students on the Campus. These options may not be mutually exclusive.

3.2 Transport Implications

Staff and Student Travel Survey 2008

3.2.1 This analysis of transport implications is based on previous assessments of travel behaviour and the results of the latest survey of travel by students and staff undertaken by the University in 2008.

3.2.2 Table 3.2 shows the surveyed travel mode for journeys to the Campus.

Table 3.2 Travel mode to the Campus

Staff/student type	% by private car	% walking	% by bicycle	% by motorcycle	% by bus
Academic Staff	83	12	3	1	1
Administration Staff	97	1	0	1	1
Postgraduate Students	94	1	0	4	1
Undergraduate Students	89	7	0	0	4

3.2.3 Some 19% of all those travelling by car were recorded as car sharing with the average occupancy being 1.075 which implies that of those travelling by car some 93% were drivers and some 7% were passengers. The percentage is probably higher for students and lower for staff.

3.2.4 The average numbers of trips per week from home to the Campus is shown in table 3.3.

Table 3.3 Number of journeys from Home to Campus per week

Staff/Student Type	Number of journeys per week
Academic Staff	6.1
Administration Staff	5.1
Postgraduate Students	4.0
Undergraduate Students	4.6

3.2.5 The Survey also included some interesting analysis of traveller’s choice of travel mode and opportunity to change travel mode:

- 42% currently combine the use of car for travel to Campus with the use of the car for other purposes;
- 47% could potentially shift to using public transport for their journey to Campus;
- 86% would use public transport if the parking cost was too high;
- 40% would be interested in using a bicycle if there were proper bikeways;
- 66% would be interested in using a public bicycle sharing system; and
- 78% would be interested in a car sharing system.

Base Forecast Case

3.2.6 The Base Case implies a very considerable expansion in the numbers of staff and students on the Campus. We have used the following assumptions based on the findings of the 2008 survey.

- 95% of academic staff will travel to the Campus on a typical weekday;
- 95% of administration staff will travel to the Campus on a typical weekday;
- 70% of all students will travel to the Campus on a typical weekday allowing for resident students who will not need to travel;
- 1.2 journeys are made daily by each person on Campus to allow for other journeys to/from campus during the day for work or social reasons;
- 20% of arrivals are in the peak hour;
- The peak parking demand is 60% of all travel arrivals; and
- 60% of students resident on Campus own a car.

3.2.7 Table 3.4 shows travel forecasts:

- % travel to Campus per day allows for those not travelling to Campus on a particular day during the academic term due to sickness, attendance elsewhere or other reasons;

- Journeys to Campus per day allows for additional journeys by staff and students to Campus from other University sites and for other purposes during the day e.g. from a shopping trip;
- % by car is the percentage of the journeys made as car driver or passenger;
- vehicle occupancy is the average number of people in the car;
- daily car arrivals is calculated as $A*B*C*D/E$;
- peak hour car arrivals is calculated as $0.2 * \text{daily car arrivals}$; and
- peak parking demand is calculated as $0.6 * \text{daily car arrivals}$.

3.2.8 These forecasts assume that the existing pattern of travel is retained in the future and that a Travel Plan has not been implemented. Implementation of a Travel Plan, as described in the next chapter, could result in a significant drop in the numbers of staff and students arriving by car, and a reduced need for highway and parking infrastructure improvements.

Table 3.4 Forecast Travel to Campus

Person type	Numbers A	% who travel to Campus from Home per day B	Journeys to campus per day C	% by car D	Vehicle occupancy E	Daily car arrivals	Peak hour car arrivals	Peak parking demand
Students	7782	70	1.2	90	1.15	5116	1023	3070
Administrative staff	778	95	1.2	90	1.05	760	152	456
Academic staff	778	95	1.2	90	1.05	760	152	456
TOTAL staff and students	9338	-	-	-	-	6636	1327	3982
Resident students	1565							939
Visitors	-	-	-	-	-	-	-	100

3.2.9 Allowing for parking and circulation inefficiencies, this implies some 4,150 spaces are needed for vehicle arrivals on Campus and some 950 spaces for resident students.

- 3.2.10 With good landscaping, some 35-40 square metres are needed for each parking space. This does not allow land required for providing access roads to car parking areas. Some 150,000 square metres will then be needed to provide for parking needs for arriving vehicles and some 35,000 square metres for resident student parking needs.
- 3.2.11 The peak hour vehicle arrival levels will be considerably higher than current levels but should be readily accommodated on the immediate road network which is Old Larnaka Road and the realigned and improved Geri-Agladja Road, with the exception of the junctions giving access to the Campus.
- 3.2.12 The junctions at the western and eastern ends of the Campus are likely to need to be improved to provide sufficient capacity to accommodate these flows. A more detailed study will be required to assess the improvements needed.
- 3.2.13 A potential difficulty is the management of traffic at the northern access to the Campus directly from the realigned Geri-Aglangia Road. The short link between the realigned road and the campus internal roadway will need to be two lanes wide in each direction and may become congested and cause blocking back onto the realigned road and the internal roadway. The proposed checkpoint on this short link will exacerbate this potential problem.

Option – Research Park

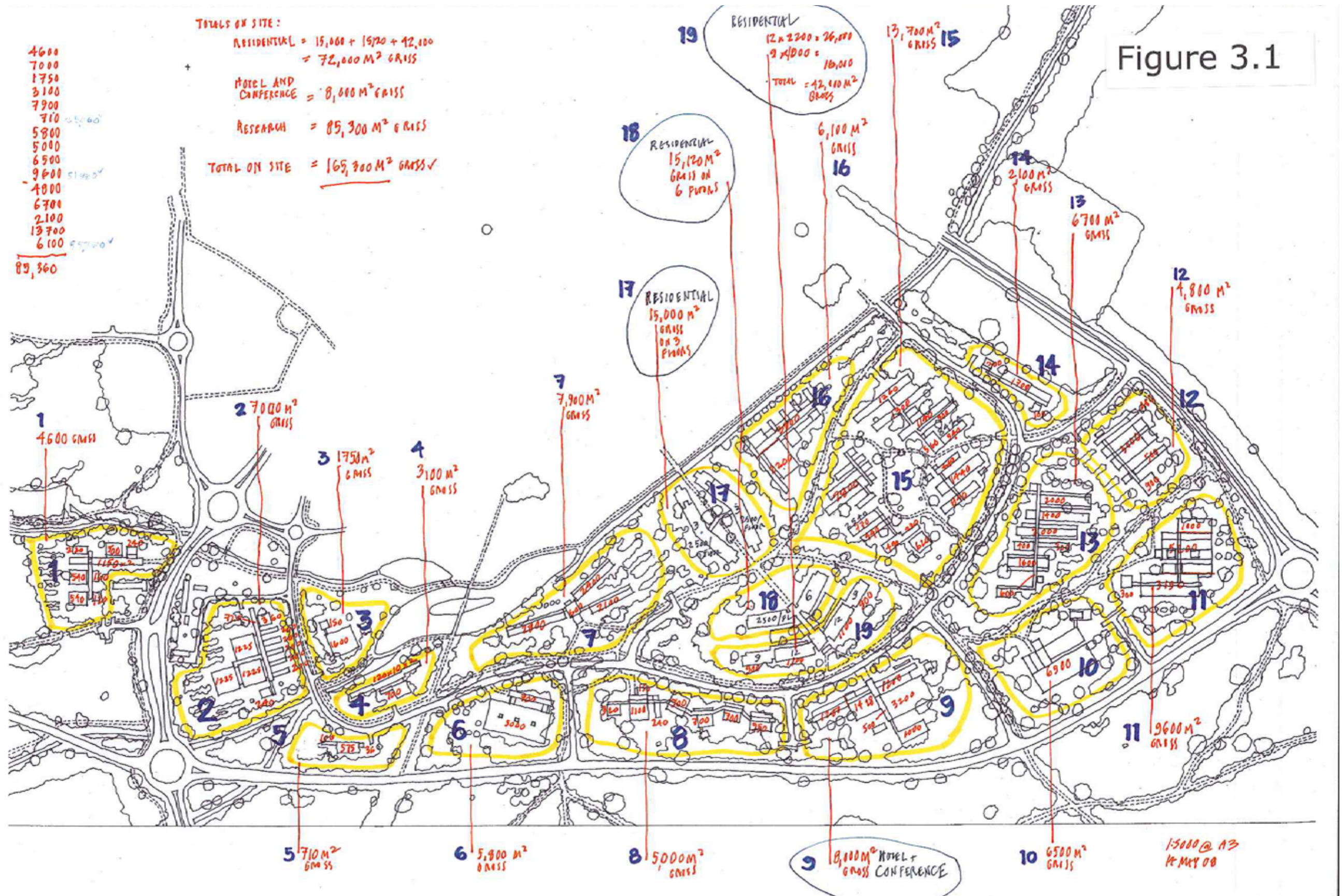
- 3.2.14 A Research Park of the magnitude proposed and situated on the southern side of the Campus, partially in the Buffer Zone, will need its own separate access(es) onto the immediate road network. This access or the accesses could be onto the Old Larnaka Road east of the current campus access and/or onto the planned extension of Kalamon Road when this built as shown in Figure 3.1. Currently there is negligible traffic on Old Larnaka Road east of the current campus access. To accommodate an access for the Research Park, the Old Larnaka Road and its existing access to the Campus would need to be improved to provide additional capacity.
- 3.2.15 A dedicated car park of the order of 2,100 spaces will be required for the Research Park land and would be located in the Buffer Zone. This implies the need for some 80,000 square metres.

Option – Expansion to 13,000 students

- 3.2.16 The traffic flows and parking demands would be about 50% greater than those shown in Table 3.2. The peak hour arrivals and departures may then be at levels which require further improvements in the capacity of junctions at the accesses to the Campus. It would be wise, if this expansion is being considered, to design the junction improvements needed to cater for 10,000 students with spare capacity to allow for 50% greater traffic flows.
- 3.2.17 The parking demand would be of the order of 6,200 spaces needed for vehicles arriving on Campus and some 1,250 spaces needed for resident students. Some 230,000 square metres will then be needed to provide for parking needs for arriving vehicles and some 50,000 square metres for resident student parking needs.

Space for Parking

- 3.2.18 The Base Case Forecast and the Options all imply a greater use, for parking spaces, of the land space available in the Campus. The parking needs could be met by multi-storey car parking around the Campus and basement parking under buildings. These are expensive options for the University. If staff and students were to be required to pay for the cost of provision of multi-storey and basement parking then this cost would be prohibitively expensive for the majority of students and for some staff.



4 Transport Recommendations

4.1 Travel Plan Principles

- 4.1.1 The social climate associated with the unconstrained use of the car for travel to work or study is changing. It is changing for at least four main reasons. Firstly, as oil prices rise in response to the drawing down of global oil reserves, fuel prices for motorists are likely to continue to rise at a greater rate than overall national inflation.
- 4.1.2 Secondly, there is a growing awareness of the need to reduce greenhouse gas emissions and a recognition that vehicle carbon emissions are a substantial and growing part of global greenhouse gas emissions.
- 4.1.3 Thirdly, increasing car use causes further congestion which implies the need for improved road capacity. The ability for cities such as Nicosia to continue to meet demand for road travel by improving road capacity is constrained by local resistance to the undesirable consequences of road building on the quality of life, particularly in residential and shopping areas, for example in Aglangia, and in areas of high environmental value, for example the Athalassa Forest.
- 4.1.4 Fourthly, increased car usage means an increased demand for parking spaces and these can be either difficult to locate because of lack of land space or expensive to provide when overground or underground structures are required.
- 4.1.5 There will then be increasing pressures on institutions, such as the University, to limit the amount of road traffic that they generate and the resultant demand for parking spaces.
- 4.1.6 Travel planning in the UK and elsewhere in Europe is a response to these pressures. Key objectives of travel plans are to provide good safe access by a range of travel modes, for example walk, cycle and public transport, as well as by car and to reduce or at least limit the amount of car travel generated by the institution.
- 4.1.7 The preparation and implementation of a Travel Plan for the University is an appropriate response to the transport demands placed on the University by the Base Forecast Case and the other development options.

4.2 Towards a Travel Plan for the University

- 4.2.1 The Travel Plan will contain a number of practical policies and measures as a response to the objectives set by the University. There will be targets for achieving these objectives, including a target to reduce the percentage of travel as car driver to and from the University.
- 4.2.2 To be successful, a Travel Plan for the University of Cyprus will need to have the support of staff and students. There is then a need for creating awareness amongst staff and students of the social, economic and environmental issues associated with car travel. This requires an on-going communication campaign with appropriate resources. The travel plan will need to achieve a change in travel behaviour by staff and students if its targets are to be reached.
- 4.2.3 There will be a need for a set of "carrots" to encourage the desired travel behaviour and a set of "sticks" to deter undesirable travel behaviour.

4.2.4 Carrots are likely to include:

- encouragement for students to live in concentrated areas from which it is easy to route bus services to the Campus;
- encouragement for staff and students to use these bus services by continuing to partner local bus companies to offer quality bus services at subsidised or discounted prices and at attractive frequencies;
- working with the Town Planning Department to improve access by walk and cycle modes to the Campus from Aglangia and Athalassa Forest;
- continuing to offer, within the Campus, good routes for walking and cycling and easily accessible bus stops;
- providing secure cycle parking areas and providing shower and changing facilities on Campus for cyclists and encouraging a Cycle User Group or Club;
- resourcing the staff post for a Travel Plan Coordinator who will provide an information service for staff, students and visitors so that they are aware of the different options for travel to the Campus;
- providing a database for car sharing and encouraging its use by staff and students;
- encouraging the use of IT and home working to limit the need for students and staff to travel to Campus in appropriate circumstances; and
- encouraging the use of cars with low carbon emissions and also car sharing by providing privileged car parking areas or reduced parking charges.

4.2.5 Sticks are likely to include:

- controls on who is eligible to obtain a parking permit;
- charging for parking;
- enforcement of parking controls and charges; and
- discouraging students from living at a location distant from the University by requiring them to reside locally.

4.3 Transport and Parking Infrastructure

- 4.3.1 A successful Travel Plan will reduce the need for transport and parking infrastructure but inevitably some financial resourcing of infrastructure will be needed.
- 4.3.2 The future layout of the University should continue to follow the existing masterplan with its emphasis on Providing a Campus design that follows urban design principles that retain a sense of "place" as well as providing for travel movements:
- restricting use of the roadway through the centre of the Campus to service and emergency vehicles and to construction vehicles when essential and providing several crossing points for pedestrians with restricted allowable speeds on this roadway assisted by traffic calming measures;
 - keeping all staff, student and visitor traffic on the local Campus distributor road and only providing parking spaces accessed from this road; and

4 Transport Recommendations

- ensuring that staff and students can freely walk and cycle around the Campus by providing legible routes through building layouts designed with walk/cycle permeability.

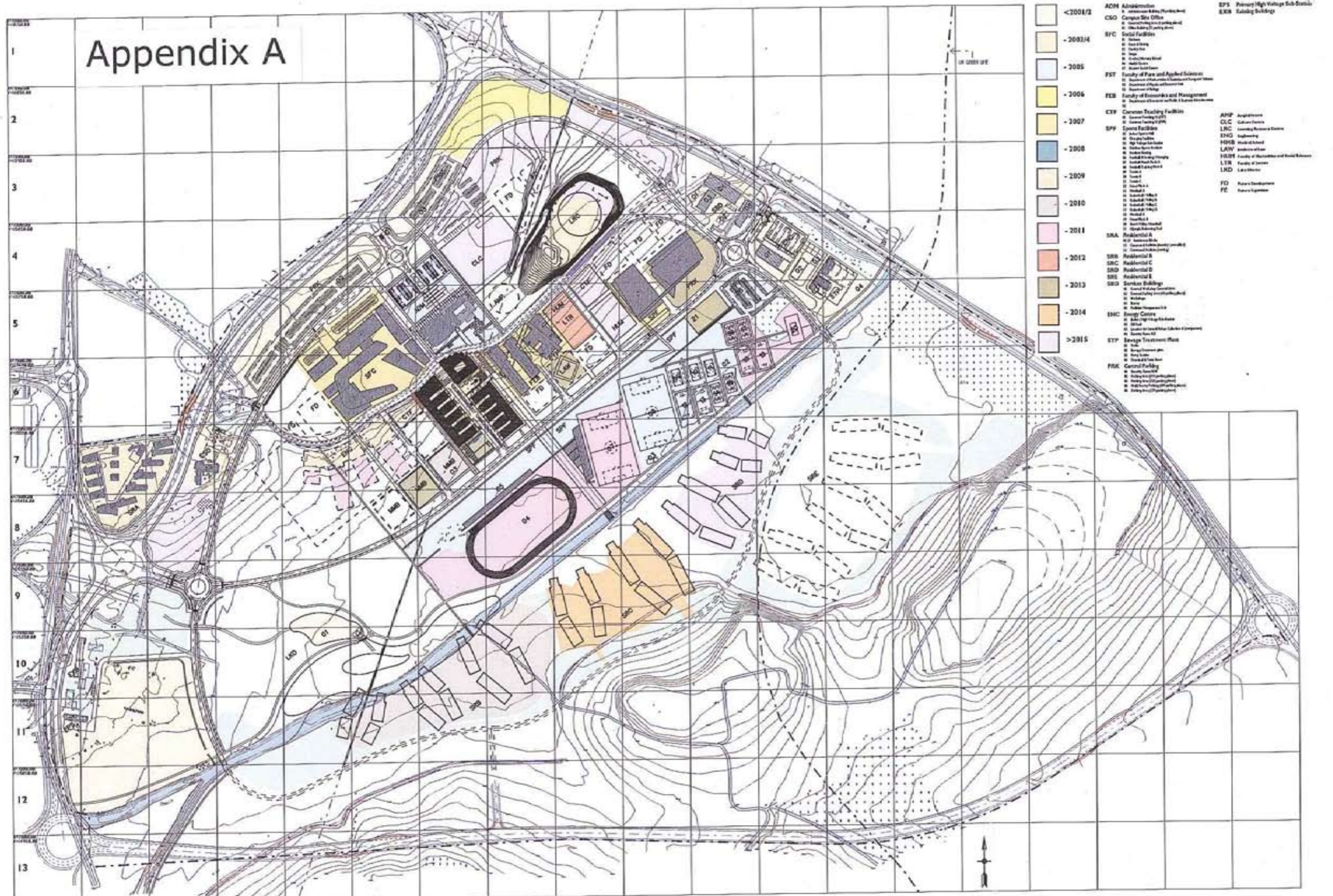
4.3.3 There will be a need to provide additional parking spaces and improved road accesses to meet the travel demands raised by the development options. The detailed need will depend on the success of the Travel Plan in limiting car journeys and the resultant demand for parking. For the Base Forecast Case it will be necessary to provide:

- more car parking spaces accessed from the Campus Distributor road;
- review the operation of the northern access formed by a direct link from this Distributor road onto the realigned Geri-Aglangia Road and possible need for controls on use of this access;
- review the operation of the western access (at a roundabout onto the Geri-Aglangia Road) and the eastern access onto the Old Larnaka Road and the possible need for traffic management or infrastructure improvements to improve the capacity of these accesses; and
- complete the southern section of the Campus Distributor road.

4.3.4 The two development options both require a political settlement and use of the Buffer Zone. They involve the creation of a Research Park and/or the expansion of the University to 13,000 students and it will be necessary to provide:

- further car parking spaces accessed from the Campus Distributor road;
- provide car parking spaces in the Buffer Zone;
- further review the operation of the western access (at a roundabout onto the Geri-Aglangia Road) and the eastern access onto the Old Larnaka Road and the possible need for traffic management or infrastructure improvements to improve the capacity of these accesses; and
- provide new accesses from the Buffer Zone onto Old Larnaka Road (with an upgrade of its capacity) and onto an extended Kalamon Road.

Appendices



UNIVERSITY OF CYPRUS
CAMPUS DEVELOPMENT OFFICE



Management Policy of Parking Places

According to the policy in effect, the parking places at the Campus will be located peripherally so as not to create pedestrian distribution problems and to be consistent with the approved Master Plan, as well.

The Campus Development Office has prepared various alternative proposals for the development and the construction of sufficient, in numbers and in quality, parking places and these were submitted to the Buildings and Campus Committee.

The Committee, after examining the alternative proposals, concluded to the following:

	parking area	area (m2)	PHASE 1			NOTES	PHASE 2			NOTES
			parking places	cost/ place €	cost €		parking places	cost/ place €	cost €	
1	PRK 02	16490	325		0	existing	325		0	existing
2	PRK 03	7355	142		0	existing	142		0	existing
3	PRK 04		315	9,400	2,961,000	multi-storey (under design)	315		0	multi-storey (under design)
4	PRK 05		124		0	existing	124		0	existing
5	PRK 06		600	9,400	5,640,000	surface / multi-storey	600		0	surface / multi-storey
6	PRK 07	6296	120	3,500	420,000	surface	120		0	surface (phase 1)
7	PRK 08	7347	150	3,500	525,000	surface	150		0	surface (phase 1)
8	PRK 09	3804	264	3,500	924,000	temporary	75		0	surface (phase 1)
9	PRK 10	2275	240	3,500	840,000	temporary	45		0	surface (phase 1)
10	PRK 11	4436	90	3,500	315,000	surface	90		0	surface (phase 1)
11	FST		12		0	existing	12		0	existing
12	SRA		68		0	existing	68		0	existing
13	SBD		40		0	existing	40		0	existing
14	CSO		12		0	existing	12		0	existing
15	ADM		76		0	under construction	76		0	under construction
16	FEB		39		0	under construction	39		0	under construction
17	SFC		75		0	under construction	75		0	under construction
18	CLC		0		0	basement	see note No.2			basement (phase 1)
19	SRB/C/D/E		750	3,500	2,625,000	surface	750		0	surface (phase 1)
20	PRK 12	8416	170	9,400	1,598,000		170	9,400	1,598,000	surface / multi-storey
21	PRK 13		500	3,500	1,750,000		500	3,500	1,750,000	surface (phase 2)
22	PRK 14		500	3,500	1,750,000	buffer zone	500		0	buffer zone
23	PRK 15		1250	3,500	4,375,000	buffer zone	1250	3,500	4,375,000	buffer zone
SUB-TOTAL			3942		16,000,000		5478		7,723,000	
							5478		23,723,000	

LEGEND

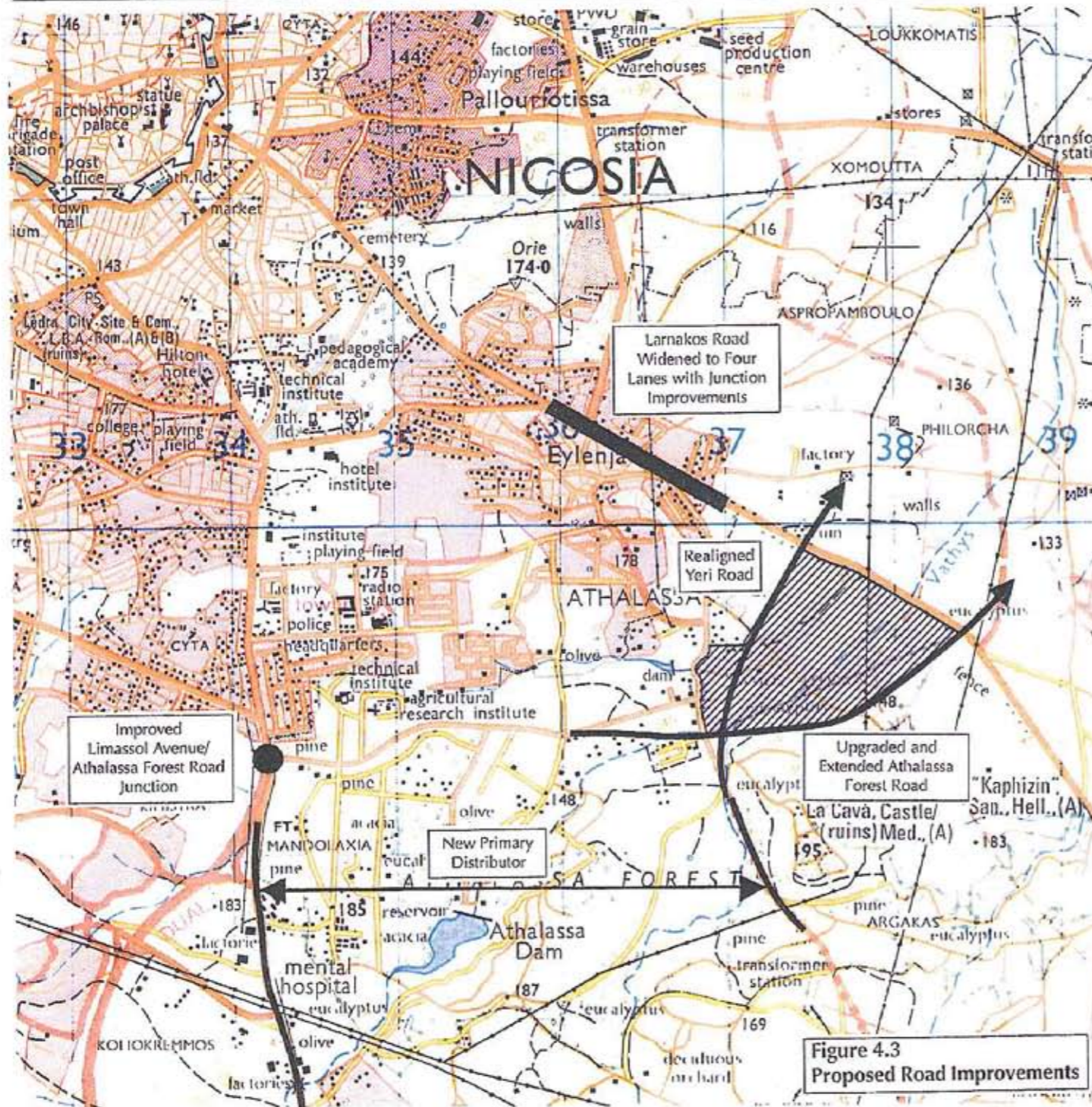
	EXISTING
	APPROVED/UNDER DESIGN/UNDER CONSTRUCTION
	MULTI-STOREY
	FUTURE DEVELOPMENT
	FUTURE DEVELOPMENT (BASEMENT)
	TEMPORARY

NOTES

- The cost of parking places is shown as 0 where:
 - are already existing, or
 - are included in other projects and the relevant cost has been approved or
 - if it concerns phase 2, they have already been included in phase 1.
- In future stage and before the construction of phase 2, the decision for basement parking at CLC will be reconcerned. This will affect the total number of parking area PRK15.

Appendix B

4. TRANSPORT STRATEGY



Road Network Improvements

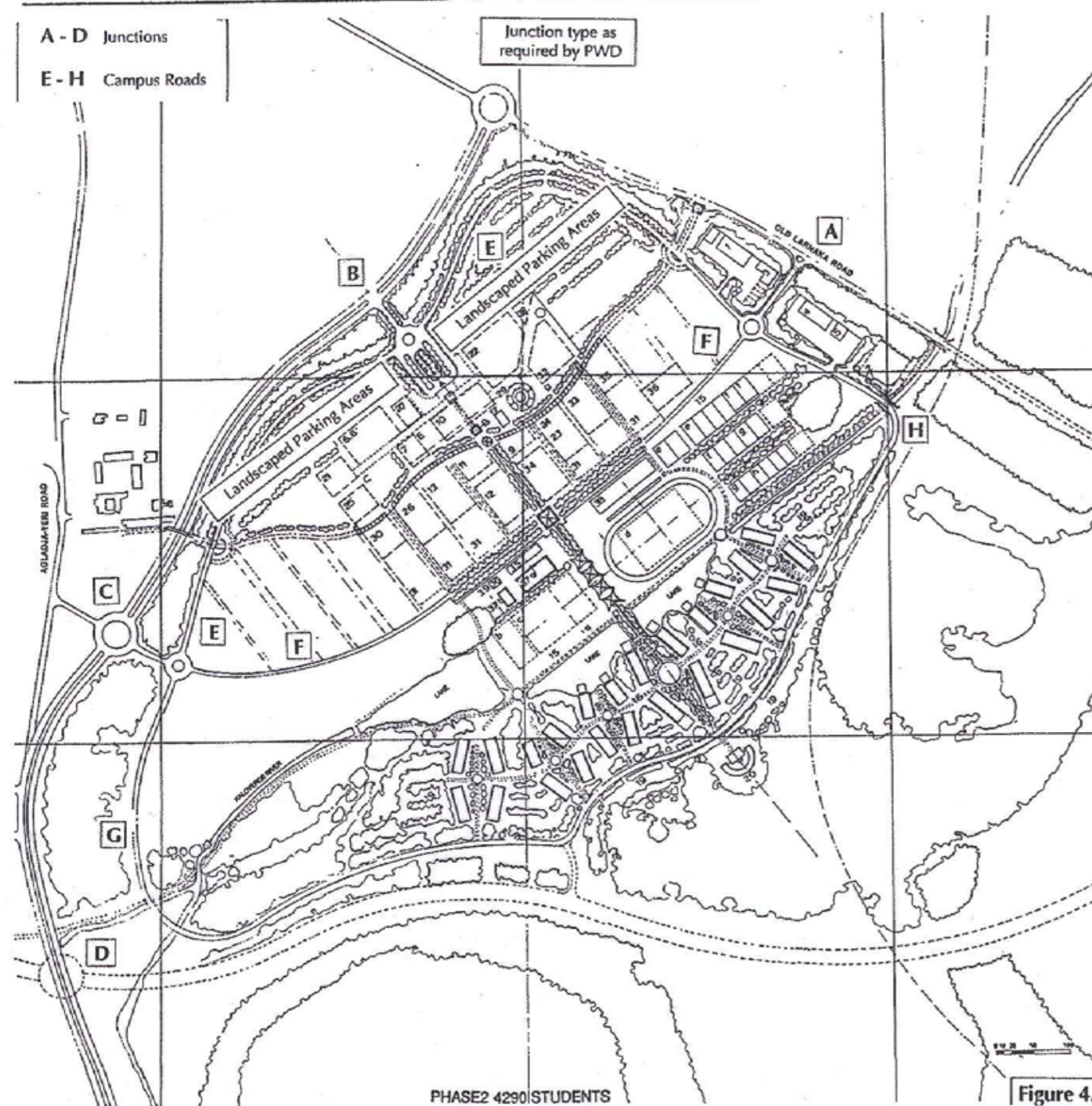
4.2.8 The PWD propose several improvements to the road network. These improvements are shown in Figure 4.3 and cover:

- improved junction of the Athalassa Forest Road with Limassol Avenue to provide for all movements;
- upgrading of the Athalassa Forest Road perhaps to dual carriageway standard;
- realignment and extension of this road to skirt the southern boundary of the site;
- realignment of the Agladja-Yeri Road to skirt the campus site and to enable a downgrading of the existing section of this road between Old Larnaka Road and Athalassa Farm to a local road, so as to reduce through traffic movements past residential properties;
- a new primary distributor road between Limassol Avenue and Agladja-Yeri Road aligned south of the Athalassa Forest;
- widening of the Old Larnaka Road to provide a four-lane highway with improvements to signalised junctions through Agladja.

4.3 Road Access Routes

4.3.1 Road access to the campus will be primarily along Old Larnaka Road, Athalassa Forest Road, Kerynelas Avenue and Agladja-Yeri Road from the Aglanga direction. These access routes will serve Agladja and the rest of Nicosia.

4. TRANSPORT STRATEGY



D off Agladja-Yeri Road south of the river, initially for construction vehicles and in the longer term, after construction is finished, for students resident on campus.

4.3.6 Junctions formed by these accesses with the Larnakos and Agladja-Yeri Roads are proposed on:

- A** Initially a priority junction with priority provided to campus traffic and subsequently a roundabout if Old Larnaka Road is reopened to traffic from the south-east following a political settlement
- B** a signalised junction with phasing for pedestrians and cyclists
- C** Initially a priority junction off the existing Agladja-Yeri Road and subsequently a roundabout with the realigned Agladja-Yeri Road
- D** initially a priority junction off the existing Agladja-Yeri Road and subsequently a roundabout when the Athalassa Forest Road is improved and realigned.

4.4 Internal Road Circulation

4.4.1 The proposed internal road circulation is also shown in Figures 4.4 and 4.5
The layout consists of local distributor roads:

- E** providing access to main car parks
- F** for service vehicles
- G** for construction vehicles
- H** providing access to campus residences.

4.4.2 Access to individual buildings for service and emergency vehicles will be provided off these local distributors, but are not shown in detail because they are dependent on the location and layout of individual buildings.

Figure 4.5

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12.0 CIVIL ENGINEERING INFRASTRUCTURE

12.01 Sewage Treatment System

Existing Works Appraisal -General

The existing works was constructed during 1999-2000. The specialist nominated subcontractor was a joint venture of CP Envirosystems and The Cyprus Waterworks Company.

The process design is as per the original design brief, and comprises the following key stages:

1. (Primary treatment comprising screening and grease separation)
2. (Secondary biological treatment using an activated sludge extended aeration plant)
3. Tertiary treatment using two-stage 'Culligan' pressure filters
4. Final effluent disinfection and pumping for irrigation/grey water re-use.

Structural Overview

The sewage treatment plant (STP) has been located in its own dedicated site compound. The access and general layout is excellent, with spare space provided for future expansion if required.

The main civil tanks and structures are constructed in reinforced concrete, all to a high standard and in visible good condition. The depths of the raw effluent pump well and irrigation tanks are sited in excess of 4 metres below ground level. Inspection showed the basement areas to be clean, dry and well-ventilated. In normal use, these structures should have +50 years of active service.

Mechanical and electrical plant is also in good condition and well maintained. However, it should be noted that in normal use M&E equipment has around 12-15 years active service, so we are now approaching the later years of life. It is recommended that high replacement cost items, such as the Culligan filters, should receive extra care and attention. It would also be prudent to start a replacements 'savings fund' as we move towards the 12 year term.

Control panels and electrical site wiring are in good condition and well maintained, but control systems have developed at a fast pace in recent years, with the result that most of the PLC units are now obsolete. There is one Siemens HMI unit (S7 series) but otherwise all controls are of the direct push button 'hard-wired' arrangement. If a reasonable sized STP extension is planned in the future, the entire control system should be upgraded to a single HMI 'touchscreen' panel complete with full logging/trending functions to monitor and optimise plant performance.

Refer to Section Appendices for full condition reports on each item of equipment.

Process Performance Overview

The STP 'low stress-low rate' extended aeration plant was specified with stable operating conditions together with reliable final effluent production suitable for irrigation to the fore. In addition, because the incoming flows were not known at the time, the main aeration plant process units were arranged to allow future (~5th year) 'Phase 2' expansion. The decision was taken to provide the 'Phase 2' tertiary filters and irrigation pumps in one go, on the basis that it was not cost effective to uprate these process items within a 5 year timescale.

The start-up plant (2001) was for a population equivalent (PE) of 443 PE and flow of 69m³/day, based upon average per capita use of 156 litres/head.day. The Phase 2 stage planned for 2004 has not been implemented because expansion of the site has been below forecast levels. The actual figures obtained during the visit (April 2008) show a current 1341 PE and flow of 34m³/day, which in effect means we are at 2004 forecast levels for population. The most important data obtained is that per capita water use is around 25 litres/head.day, much lower than the 156 litres/head.day used in the forecasts. This is a reflection of the times, with climate changes leading to several years of low rainfall in Cyprus, and the adoption of measures to reduce potable water use throughout the campus site. The net result is that the STP is operating at < 20% of its flow capacity and this gives the added benefit of higher levels of final effluent quality due to reduced loading.

In terms of process performance, the STP has more than sufficient spare capacity to cater for the next 10 years based on the current site forecasts. It should be noted that if student numbers were to increase to around 8,000 (with 600 resident), the improvements obtained in water saving would still mean the STP operating at 2005's forecast levels. In basic terms, the plant is large enough and major savings in water use have further improved the situation.

There are some operational problems associated with running the STP well below its design rating, and the major one is inefficient use of power. The aeration tanks use air from a 15kW blower installation, and this is for a 203m³/day set-up. The current 34m³/day set-up does not require such a large air input and it would be sensible to control the blowers using a dissolved oxygen sensor, to save power costs - now standard practice on all UK sites. Estimated current costs (@£.08/kW.hour) would be around £10,500 per annum, and at least 40% savings would accrue from a capital investment of around £8,000 to achieve automated blower control. In general terms, aeration accounts for around 70% of sewage treatment power costs, so it should be the foremost target for savings.

Refer to Section Appendices for updated Flow v Load Forecasts.

Recommendations

The recommendations arising from the site inspection of April 2008 are listed below:-

- 1) Maintain the same high maintenance standards - the dividends are now apparent.
- 2) Update the control system for the '21st Century' - trend information is the key to planning.
- 3) Save power costs - use dissolved oxygen monitoring to control the air blowers.
- 4) Replace the screen with an automated 'bag' unit to reduce operator contact with sewage.
- 5) Assess performance of the activated sludge plant with a view to single lane operation.
- 6) Ensure that new restaurant developments have local grease traps.

Conclusions

The inspection visit reinforced the importance of good planning and a 'get it right first time' approach to engineering in general.

The benefits of investing in higher capital cost materials, such as reinforced concrete for the tanks and other structures, together with adding Phase 2 irrigation equipment to the Phase I build to optimise installation costs has given dividends, with all of the main structures in excellent condition 8 years on, plant operation has been straightforward and final effluent quality has been maintained on a continual basis.

There is no reason to believe that this STP installation cannot continue to provide first rate service, notwithstanding significant development of the campus site, for the next 10 years and more.

12.02 Irrigation & Water Recycling.

Review of Current System

At the time of the original masterplan, the irrigation system was based on re-use of treated sewage effluent, storage and re-use of excess rainwater and abstraction of shallow groundwater at the eastern end of the Kaloyeros valley. Towards the latter stages of the masterplan development, it became clear that there were potential borehole supplies some 3km to the west of the campus and the CDO felt that this could give a more secure, readily obtainable irrigation supply at lower initial capital cost than the on-site groundwater sources. Two boreholes were duly brought into use and a supply pipe was laid alongside the highway through the Athalassa Forest and routed through the southern campus towards the sewage treatment plant. At the same time, potable water supplies and distribution mains were laid to a header tank on Aronas Hill and a second tank was installed on Aronas to act as a header tank for the grey water and irrigation system. The main features of this arrangement are shown in Figure 1.

The boreholes have a licensed flow rate of 25 and 12 m³/hr for a 12 hr period giving a maximum total of 444 m³. This limit is not the capacity of the boreholes but a security limit imposed from the Water Development Department. Included with the Sewage Treatment Plant is a 400m³ irrigation tank. Currently this receives a direct feed from the boreholes, which combines with the chlorinated outflow from the sewage treatment works. We understand that the normal mode of operation is to import about 100m³/day of borehole water, which is mixed with an average

35m³/day of treated effluent and this provides the daily average 135m³ of greywater and irrigation (i.e. variable speed) . Three inverter-controlled irrigation pumps feed into the distribution network via a filter at a maximum combined rate of 55m³/hr. There is a manually controlled valve that permits a supply up to the header tank on Aronas Hill. This is used for short term security of supply, not for maintaining pressure in the system.

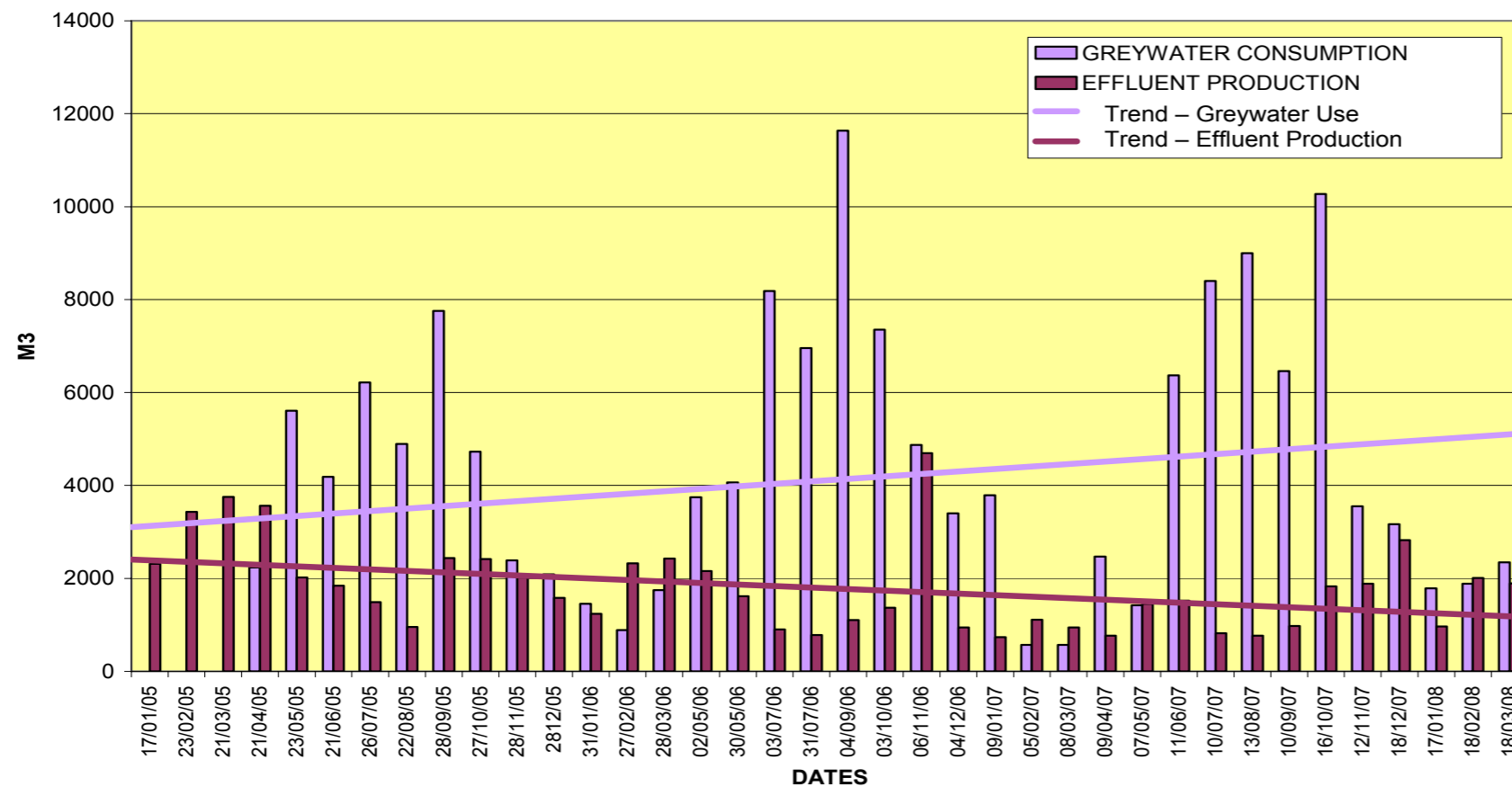
The following graph illustrates recent metered consumption of greywater compared with effluent production from the sewage treatment plant. Where the effluent production exceeds the demand for greywater, this would indicate that the resultant surplus is discharged to the Kaloyeros River. However this may be deceptive and it needs to be established whether the filling of the irrigation tank prioritises use of treated sewage effluent or the borehole supply. It is important to ascertain which has priority because wasting treated effluent should be prevented if at all possible and we recommend that a review of the irrigation tank operation is carried out.

The trend lines are interesting in that the effluent production appears to be gradually reducing. This may be due to the level of construction activity on site and may reflect the fact that some of the construction dewatering operations may have distorted the figures. It is expected this trend will start to reverse as site occupancy increases. The increasing trend in greywater flow is assumed to be due to the increased demand for irrigation given the recent low precipitation and gradually increasing planting areas.

The CDO has confirmed that their current estimate of greywater usage for toilet flushing is 5,000m³ per year (average 417m³/month). For future planning of water demand it is essential that an accurate assessment of the irrigation consumption is carried out so that a more exact split between toilet flushing and irrigation volumes can be established. This will inform decisions on future potable water demand, landscaping concepts for the proposed faculties, the potential for additional lakes and the advantages of abstracting groundwater within the site curtilage rather than using remote boreholes.

The irrigation system consists of a series of solenoid controlled valves which permit flow from the grey water distribution network into a number of separate irrigation zones under the control of a programmable controller. The system has a potential for 500 separate zones, of which 153 are currently used. The zoning is carried out based on the experience of the landscape contractor who assesses ambient weather conditions against the needs of each type of planting. Automatic weather stations are not thought to be worthwhile as they cannot factor in all the parameters that are necessary for each individual zone. Irrigation is normally programmed to occur overnight to prevent unnecessary evaporative losses.

The system appears to function without any technical problems but whether the irrigation is being provided in the best interests of the various types of planting is discussed in the landscape section of the report.



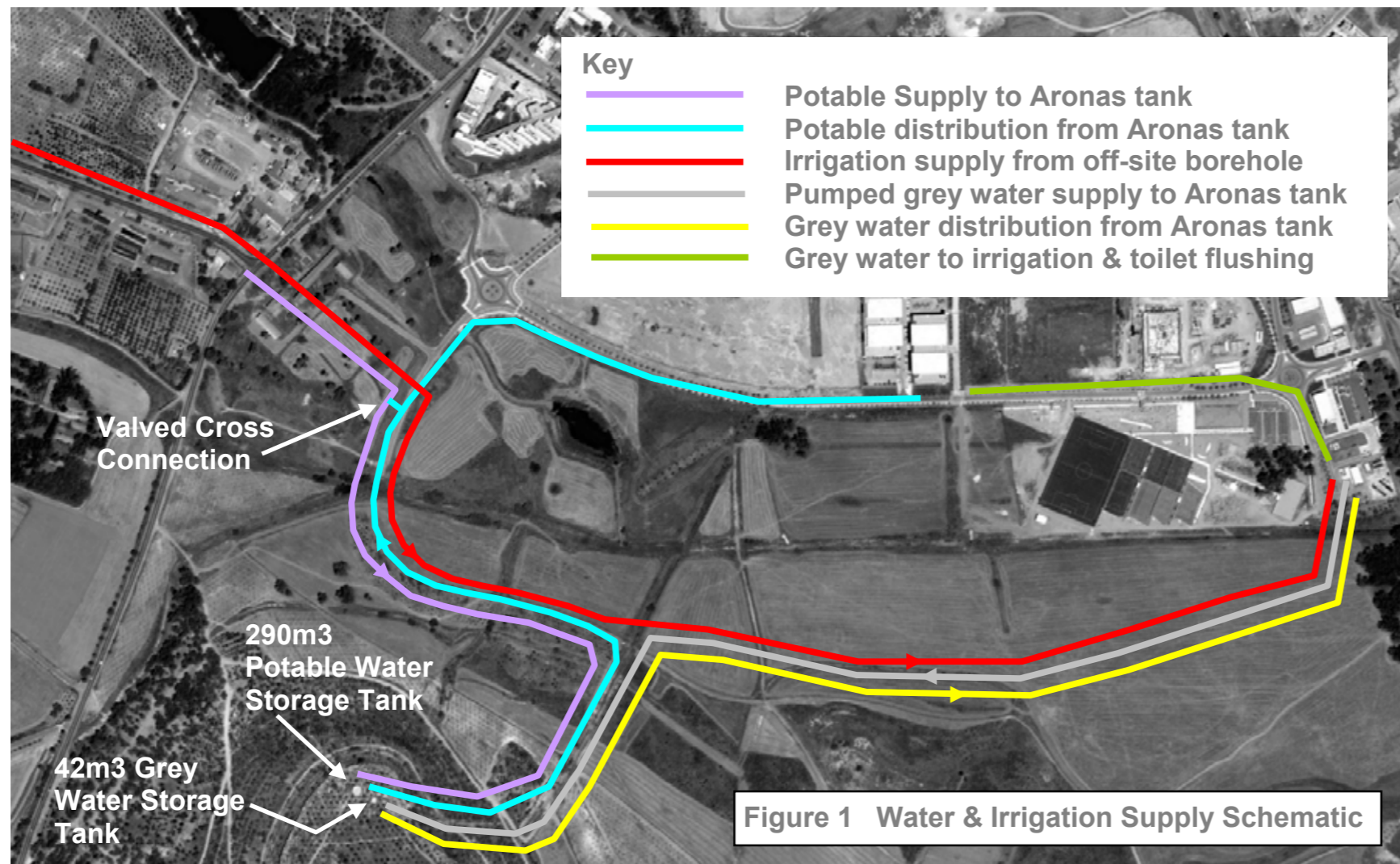
FUTURE IRRIGATION & WATER RECYCLING STRATEGY

It is assumed that the short term development proposals for the campus will tap into the irrigation and grey water systems already available. Additional irrigation zones will therefore be gradually added to the existing controller. The following factors will need to be considered for the medium and longer term should the campus area grow gradually southward and westward as currently envisaged:

- Pressure losses in the system may be too great to permit extension too far south or west. This may generate the need for a separate distribution network, possibly working directly off the Aronas tank.
- Increasing site occupancy may demand a higher proportion of grey water for toilet flushing at the expense of water available for irrigation. However the available borehole supplies should be able to cope with the increase provided the abstraction limit is not reduced by the Water Development Department in an effort to meet increased water demand in other areas of Nicosia.

- Increasing need for irrigation water as the landscaping becomes more widespread begs the question should new development be discouraged from 'over landscaping' their external areas whilst more emphasis is given to the expansion of the Athalassa Forest 'grain'. This is discussed in the landscape section of the report.
- The effect of improved water conservation measures through specifying low (or no) water using sanitary equipment in new developments could free up additional irrigation water.
- Ownership and maintenance responsibility issues (particularly towards the southern and western extremities of the site) may come into play if development is wholly or partially as a result of private investment. How would such developments contribute to the irrigation and grey water supplies and will they be encouraged to make their own arrangements at the risk of losing control of both the sustainability benefits and the quality of landscaping?

The stormwater storage facilities and groundwater abstractions suggested in the original design were not installed so there remains the opportunity to re-visit these proposals should there be sufficient justification. Several of the building projects already on site have had to install permanent groundwater pumps to reduce groundwater levels around their basements. These include the Sport Facilities, The Faculty of Economics and Business as well as the CTF2 (common teaching facilities) and the Extension of the FST (Faculty of Sciences and Technology). This confirms the potential for shallow groundwater abstractions to augment the grey water system. At present the groundwater pumps referred to discharge to the stormwater system and it would be worthwhile investigating whether they could be incorporated at some stage into a well-point collection system roughly in line with the original proposals.



12.03 Storm Water Drainage

REVIEW OF CURRENT SYSTEM

The stormwater system has been installed generally in accordance with the original Phase I infrastructure design proposals. From the original data reviewed there is some conflict in the parameters used for the original design for the stormwater system but we believe it was based on a 2 year return period storm, with checks carried out to ensure no surface flooding in critical areas under surcharged 1:20 year storm conditions.

The missing element of the original masterplan drainage scheme is the stormwater balancing pond that was intended to conserve stormwater both for irrigation and for topping up of the lakes. In lieu of this system, a number of direct stormwater connections have been made to the Kaloyeros (Vathys) River. It is understood these are considered to be temporary and that the long term proposal is to marshal all the available flows to a point where they can be distributed and treated as necessary to maximise the sustainable use of water.

There have been some isolated incidences of surface flooding on the loop road due to surcharging of surface water drains during prolonged periods of heavy rainfall. Figure 2 shows the locations.

Area A is at the low point on the western arm of the northern loop road. Drainage is via kerb drain units and it is suspected that these may have become locally silted, thus reducing capacity. However, if water levels in the receiving ditches were temporarily very high, the hydraulic gradient

may have been temporarily reduced, which could have caused the surcharge.

Area B is on a relatively flat area of the loop road adjacent to the car parks. Unless the rainfall intensity at the time of the surface flooding was greatly in excess of the 1 year return period used in the stormwater design, we suspect that the localised surcharge was due to partly silted surface drainage channels or silted receiving drains.

Area C is at the eastern roundabout, which is at the low point of the eastern sector of the loop road. It is understood that water levels in the Kaloyeros were temporarily very high at the time. This would have reduced the hydraulic gradient between the roundabout and the river discharge point, which could have caused the surcharge.

Area D is associated with the stream that feeds the lake. It is understood that the culvert beneath the access road was surcharged during an extreme rainfall event. This caused some flooding upstream of the culvert which spread laterally, eventually flowing southwards along the road towards the

Kaloyeros River. We do not have access to the original design calculations but we understand from information provided by the CDO that the culvert was designed to carry the estimated 25 year run-off from the upstream catchment, which was calculated by one of the local authorities. The fact that the flood occurred indicates that either this flow rate was exceeded (the most likely explanation given the anecdotal reports of the extreme conditions at the time), or the original flow assumptions were inaccurate or catchment conditions have changed such that higher surface run-off was experienced.

The surcharge events are understood to have been rare and not particularly problematic, however it may be beneficial to check the rainfall figures experienced during the storm events in question against the design parameters and also to instigate some checking of the local drainage to see if de-silting works are necessary.

On a general point it was noted that more frequent access points would be useful for maintenance of the kerb drain systems already in place and we would recommend that these are retro-fitted at say 100m spacing.

One of the storm discharges to the Kaloyeros River

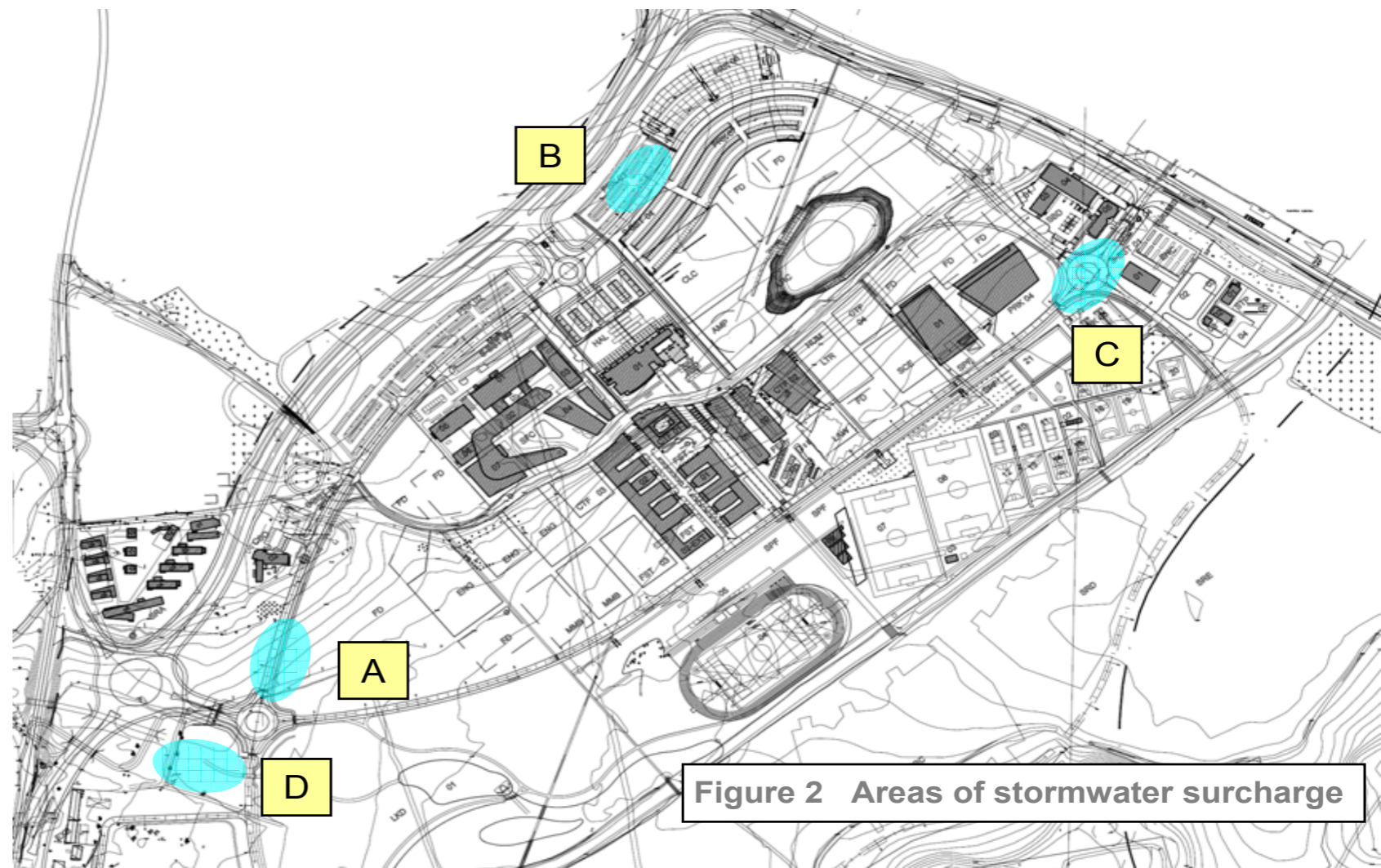


Figure 2 Areas of stormwater surcharge

FUTURE STORMWATER STRATEGY

It is assumed that the short term development proposals for the campus (engineering, learning resource centre etc.) will simply tap in to the infrastructure drainage network already available. However the medium to longer term expansion of the campus may need to consider a slightly different set of drivers, which may affect how the expanded stormwater infrastructure is planned. The following important factors need to be considered:

- Climate Change Effects.
- Scope for water conservation.
- The amount of hard surface cover created.
- Ownership and maintenance responsibility (particularly towards the southern and western extremities of the site).
- Flood routing under surcharge conditions.
- Sustainable Drainage Systems.

Piped Infrastructure Drainage		Infiltration Systems	
Advantages	Disadvantages	Advantages	Disadvantages
Efficient at removing run-off.	Requires advanced planning of infrastructure pipe network.	More dispersed run-off similar to natural conditions.	May require large storage capacity if permeability of soils is low hence space usage and cost implications.
Design is predictable and well established.	Needs coordination with other below ground services.	Reduced amount of pipe reticulation therefore lower cost of piped systems.	Effects of siltation can be difficult to remedy.
Designers & contractors are familiar with principles.	Cost.	Recharges local groundwater aquifer (but this is not necessarily beneficial if there is no subsequent abstraction or base flows into watercourses).	Systems need a higher degree of silt removal, which can generate more onerous maintenance.
Relative ease of maintenance and inspection.	Maintenance required by overseeing body.	Can be dealt with on a plot by plot basis without the need for overall infrastructure in advance.	Needs to be positioned away from building foundations etc. especially in expansive soils. Likely to be problematic under paved areas.
Can operate at higher flow rates under surcharged conditions.	No local groundwater recharge.	Improvements in water quality possibly without the need for oil interceptors (although at this location this may be of negligible benefit as it is unlikely that the water would ever re-emerge as base flow to a watercourse).	Variable ground conditions need to be thoroughly investigated for design of individual soakaways to be successful.
Provides opportunities for collecting water for use in lakes, which may in turn have beneficial ecological advantages.	Concentrates run-off, which may subsequently cause flooding or damage at the point of discharge during extreme events.		Loss of opportunity to contribute to lakes.
Discreet – ‘out of site & out of mind’.	No improvement in water quality available apart from oil interceptors.		Tends to have a lower finite capacity than piped systems so the consequences of very high rainfall become more critical.

If climate change predictions prove correct, more extreme weather variations can be expected. This may result in more extreme storms with potential for surcharging of drainage systems (which cannot economically be oversized to suit) and potentially damaging overland flood flows. Provided these effects are carefully considered and modelled at design stage, their effects can be managed as part of a holistic design process. Careful planning of site levels, sensible drainage routing and allocation of flood routing zones needs to be integrated into future tranches of development. Where plots are developed by independent groups (e.g. the science park plots etc.) there must be a respect for the effect on neighbouring plots in terms of stormwater run-off and the routing of flood flows. This would particularly apply to the south of the masterplan area where the topography is relatively steep.

The opposite effect of the climate change predictions could be long dry periods with little or no rainfall. This trend has already been noted in meteorological data supplied through the CDO (although the trend was bucked during the 2000-2004 period when heavy winter rainfall was experienced). Pressure is likely to mount on the need for water conservation measures associated with new development. Whereas the UoC currently has a commendable system for treated effluent re-use, there are no measures for the re-use of other water resources such as roofwater or run-off from paved areas. This is understandable in a climate like that of Cyprus where payback periods for recycling from these sources would be excessively long compared for instance to the UK. However, there remains scope for shallow aquifer recharge using the alluvial gravels in the Kaloyeros River flood plain. This concept was developed in the initial masterplan but was never taken up due to the availability of borehole water near Latsia some 3km west of the campus. Rather than discharge surface water from new developments indirectly to the Kaloyeros River where it is lost downstream, a system of soakaways and well points suitably located, would allow a proportion of the water to be recycled. This would not only further reduce dependence on remote borehole water and/or potable water but could also assist with the creation of lakes and/or provide opportunities for ground source energy systems as suggested in the Utilities and Energy section of the report. As mentioned previously, there may be opportunities to re-use water abstracted from building basement areas where de-watering systems have been necessitated for their construction. We recommend a general review of this possibility is carried out.

As the University development zone becomes more and more remote from the core faculties i.e. the southern and western extremities of the greater campus area, new storm drainage systems will be needed for the various development plots. The site topography generally dictates that the majority of the available sites would naturally discharge their run-off northwards towards the Kaloyeros valley. In contrast, the potential development in the far south east of the masterplan area has a slope towards the south east and therefore its surface drainage may need to be linked in with the new highway works and drain to an alternative river catchment further to the south. A decision needs to be taken whether the new development areas are provided with a system of piped infrastructure drainage or whether consideration should be given to encouraging local infiltration as a more sustainable alternative. The pros and cons of each are tabulated to the left.

If the density of development permits, an alternative approach would be to create a series of wadis (normally dry watercourses) that would route storm run off through undeveloped (landscape) zones thus avoiding the need for large amounts of buried infrastructure. The effects of bed erosion on these features would need to be considered and on steep slopes, intermittent bunds would be advisable to kill the energy of the flow. Such a system is unlikely to provide advantages in terms of the creation of further lakes but it may prove to be the most cost effective and practical surface water drainage solution.

Should the desire to enlarge the lake system and the concept of water conservation become the primary drivers, a more managed stormwater system would be needed. In this case, a series of main carrier drains would be required as an enabling stage prior to development taking place otherwise the drainage could develop in a piecemeal and uneconomic fashion without an eye to the bigger picture and the water conservation measures mentioned previously. This would involve some 'up-front' development costs for the university and a strategy may need to be developed for recovering some of these costs from any subsequent private sector developers. The same obviously applies to foul drainage and other utilities.

As far as flood routing is concerned, each development plot would need to take account of potential flooding and overland flows during extreme rainfall events. With careful design of levels, car park areas and other hardstandings can be deliberately used for short term, shallow storage of stormwater. However, sites should be planned such that essential infrastructure is remote from the lowest areas where flooding could occur. Developments should have sufficient freeboard between floor levels and external areas to prevent floodwater getting into buildings. Emergency access routes to and from buildings should be kept clear of any potential flood level. For the absolute worst case conditions, consideration should be given to routing floodwater through and off the site to lower level land where this would not damage other development. The possible effects of erosion of soft surfaces and landscaped areas would need to be factored into the design.

12.04 Foul Water Drainage

REVIEW OF CURRENT SYSTEM

The foul drainage system together with the associated sewage treatment plant has been installed generally in accordance with the original infrastructure design proposals. The sewage treatment plant is discussed separately.

There have been few problems associated with the foul drainage system. Some difficulties were experienced with very deep manholes along the service road. It is understood that the plastic manholes used were not able to support the ground pressures imposed (exacerbated by higher groundwater levels in this area) and that some remedial grouting work had to be carried out in order to stabilise the soils around the manholes in question. In addition to this were two pipe failures (believed to be on the pressurised grey water system at the treatment works) and

a quality failure due to chemicals used in the laboratories. A repeat of the latter issue has been avoided by the introduction of new procedures for laboratory discharges. We would recommend that similar pollution prevention measures will be incorporated into future sciences/engineering development briefs.

In the original masterplan, mention was made of the public sewerage system proposed for the Agladgia municipality. At the time of the April 2008 site visit, this system was finally being constructed, with evidence of a major pumping station under construction near the extreme south western corner of the campus (see Figure 3). The public system is mentioned because it may have an important part to play in the expansion of the wider campus as described below.

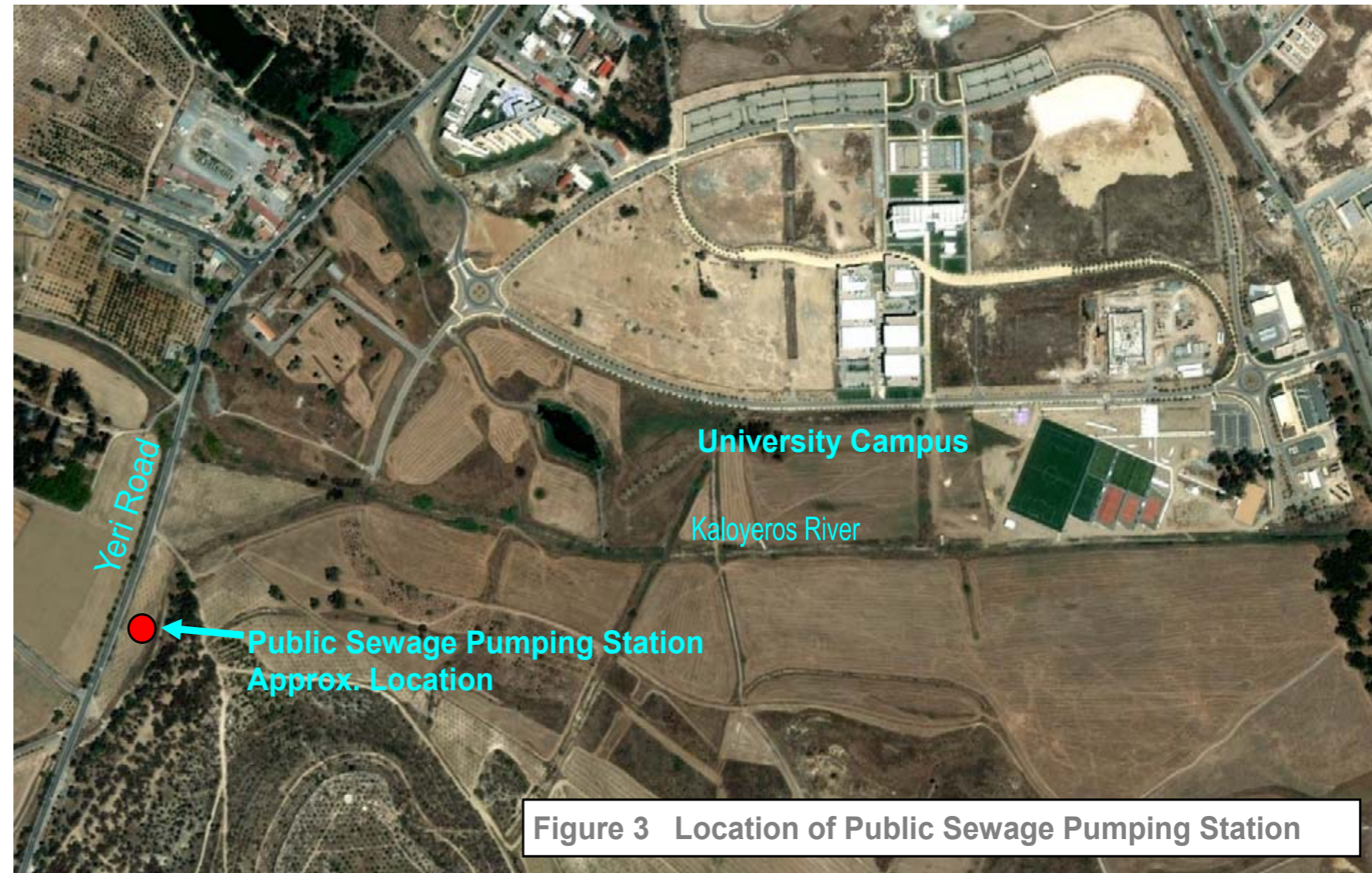


Figure 3 Location of Public Sewage Pumping Station

FUTURE FOUL WATER STRATEGY

As with the stormwater system, it is assumed that the short term development proposals for the campus will tap into the infrastructure drainage network already available. The following factors will need to be considered for the medium and longer term should the campus area grow gradually southward and westward as currently envisaged:

- Whether to partially connect to the new public system.
- Increasing need for recycled water for toilet flushing.
- Increasing need for irrigation water as the landscaping is developed.
- Effect of improved water conservation measures through specifying low (or no) water using sanitary equipment.
- Ownership and maintenance responsibility (particularly towards the southern and western extremities of the site).

Of these issues, the major one to consider is the availability of a connection to the public foul system. This was not an option during the early phases of development, which resulted in the installation of a sewage treatment plant solely for the new campus. It is understood that by law, once a public sewer is available, properties are required to connect to it. The CDO has broached this issue with the Sewerage Board of Nicosia and it is understood that this will not be applied to the University given the scale of the system they already have in place. The obvious advantage to the current 'private' sewerage system is that there will continue to be a source of treated effluent available, solely controlled by the University, for irrigation and toilet flushing. On the other hand, there is a considerable cost to the university in terms of energy use, maintenance and staff costs to keep the current plant operating. It would be useful to carry out a cost benefit analysis to establish the relative benefits of the current system versus connecting directly to the public system. This assumes the public system has sufficient capacity to receive the University's flow.

There certainly seems to be scope for some of the western areas of development to connect directly to the public system. In particular, if the proposed development of fairly intensive student housing along the new highway to the north west of the site becomes an adopted part of the masterplan strategy, the option of connecting this development to the public system should be weighed against connecting to the university system with the long drain runs, long return routes for recycled water and increased cost of treatment and pumping that this would entail. Obviously the loss of potential irrigation/grey water and consequent higher demand on borehole water for irrigation needs to be viewed in the light of the growing sustainability aspirations of the University.

In the more central and south easterly areas of campus development, south of the Kaloyeros River, it is assumed that foul water would be collected and delivered to the existing sewage treatment plant for treatment and recycling. Thus a system of main sewers would be required as an enabling stage prior to development taking place otherwise the drainage could develop in a piecemeal fashion. As with the storm drainage, this would involve some 'up-front' development costs for the university and a strategy may need to be developed for recovering some of these costs from any subsequent private sector developers/occupiers.

The potential development in the far south east of the masterplan area has a topography sloping towards the south east and therefore its foul drainage would need to be pumped northwards in order to reach a point where it could gravitate to the existing sewage treatment works.

12.05 Lakes & Watercourses

Bearing in mind the initial lake was constructed largely in order to test the long term performance of open water bodies on the campus, we believe it can be concluded that lakes are viable and with careful management of the available water resources, there is scope for further lake establishment if so desired.

The lake installed in Phase I appears to have been a success in terms of maintaining its water level through periods of unusually low precipitation. It also appears to have established a reasonable ecological balance with no reports of algal problems, which is encouraging given the high temperatures and strong sunlight. The reed margins and vegetation around the lake generally need to be managed such that they do not encroach and cause gradual silting, which would have a detrimental effect on water quality and in turn, ecology. Further comment on this aspect can be found in the landscape section of the report.

It should be borne in mind that the lake is lined and therefore has no losses to groundwater. At present, the only inflows to the lake are via the watercourse that links it to the Ayiou Georgiou park lake. The watercourse runs in a shallow valley that also picks up local run-off from the Yeri Road. At the time of the site visit in early April 2008 there was a very small flow (in the order of 0.5 – 1 litre per second) entering the lake. This was after an extended period of very low rainfall and prior to the small amount of rain that eventually fell during the latter part of the visit. The source of this flow is not known but it is obviously not direct surface run-off so it may indicate that the Ayiou Georgiou Lake is being kept topped up via boreholes, resulting in slight overtopping of the control dam. Alternatively there may be a gradual groundwater flow (possibly augmented by effluent soakaways in the Agladjia area) in the alluvial material associated with the shallow valley. It would be useful to re-visit the operation of the Ayiou Georgiou Lake in order to factor the potential overflows into the general feasibility of further lake expansion.

In the short to medium term, the catchment contributing to the lake will be considerably influenced by the run-off from the new by-pass works, the majority of which will discharge directly to the lake. Unfortunately, most of this run-off will pass straight through the lake as there is unlikely to be any available freeboard to act as storage during heavy rainfall. The advantage of additional lakes downstream of the current one would be the opportunity to collect more of the instantaneous site run-off; however this will require a different management regime, which would allow variation in lake level and a degree of freeboard provided to receive incoming storm flows.

The other influence of the by pass run-off will be a change in water quality with the likelihood of a drop in quality due to the inevitable increase in traffic. It may become necessary to construct a wetland area upstream of the lake where partial removal and treatment of polluted highway run-off (particularly the first flush of stormwater) could prove beneficial to lake

Upstream end of the lake showing minimal base flow



water quality. From the drawings we inspected at the Highway Contractors office we did not see any evidence of pollution prevention measures so we would suggest this issue is addressed with the Public Works Department as there may be some mechanism for funding such a facility within the Highways budget. Ideally the facility should be designed to avoid water losses into porous soils as this would count against the water quality benefits in terms of lake viability. The effects of silt in the highway run-off should also be addressed upstream of the lake, with preferably a stilling basin that can be periodically cleared of silt by mechanical means.

With regard to the expansion of the lake system further to the east and south of the current lake, we have reviewed the original data used to calculate the balance of available surface water run-off, borehole water and treated effluent flow against the estimated irrigation demand. Any surplus would indicate the volume and thus the plan area of lake water storage that could be achieved.

In 1999 the assessment indicated that there would be a deficit of water available to maintain lakes whilst irrigating at the required level after only 2 years of campus development. However there were a number of assumptions in respect of irrigated areas, areas of hard-standing, student occupancy, rate of development, daily water consumption, storage of surface water in lagoons etc. that render the original water balance somewhat irrelevant.

We recommend that once the revised masterplan strategy in terms of the extent, density and occupancy of development plots has been accepted, a revised water balance calculation is carried out based on

- actual potable and grey water consumption figures,
- revised rates of irrigation based on the agreed landscape strategy,
- more accurate assessments of surface run-off available
- availability of borehole and shallow aquifer water.

This level of design is considered to be beyond the scope of this review.

Without the benefit of detailed water balance calculations at this stage, it remains our opinion that a second lake system is viable given the hydrology of the Kaloyeros/Vathys valley and the availability of ground and surface water from a number of sources, some of which were not considered in the original water balance calculations. The available water resources now comprise

1. Flow from the Ayiou Georgiou lake system.
2. Flow from the Kaloyeros/Vathys catchmen.
3. Shallow aquifer water (possibly sourced via the building de-watering systems).
4. Surface run-off within and adjacent to the site (e.g. the new by-pass etc.).
5. Treated sewage effluent from the University.
6. Treated sewage effluent from the new public system.
7. Treated sewage effluent from the hospital site.
8. Existing Boreholes in the Athalassa forest.

Some of these sources, particularly those involving pump systems are less attractive than others in terms of cost, long term sustainability and energy use. During the development and implementation of the masterplan, the desirability of lakes both from the landscape/ecological perspective and as a possible source of cooling for the new developments needs to be weighed against the carbon footprint and overall environmental impact of each of the potential water resources.

The next phase of lake development shown on the masterplan proposals will introduce more complex design issues due to the larger catchment of the Kaloyeros/Vathys and the greater extremes of flow likely to be experienced. It was interesting to learn during the 2008 visit that some considerable flows have been experienced in the Kaloyeros, particularly during the wet winters of 2000 to 2004. The river is reported to have run bank full during these events, which is surprising given the control provided by the Athalassa Dam upstream. Unfortunately the flow in the Kaloyeros upstream of the site is no longer gauged and from our discussions with the Water Development Department, management of the Athalassa Dam does not seem particularly concerned with accurate control or measurement of downstream flows. If the lakes are to be developed it will be necessary to agree a detailed flow management strategy with the Water Development Department so that excessive flows through the university site are avoided as far as possible. There may also be opportunities for the Water Development Department to permit compensation flows downstream to maintain lake levels on the University Campus. The same applies, to a lesser extent, to the hospital run-off, which is managed via a balancing pond to the east of the Athalassa Dam. It would be useful to establish what design parameters were used for the pond and what discharge can be expected in the event of extreme storms. We recommend that a dialogue is opened with the relevant parties in control of these systems in order to develop a meaningful strategy for the enlarged lake system, should this continue to be the desired way forward.

Once the potential peak flow rates in the Kaloyeros have been established, these will need to be factored into the physical design of the lake structures, with adequate provision for large fluctuations in flow rate in terms of hydraulic capacity and the prevention of erosion. Management of silt and plant debris etc. in suspension will also be crucial as the high flow rates are bound to be heavily silted given the nature of the local landscape characteristics.

12.06 Other Hydrological Issues

Some useful hydrological data has been supplied by the CDO resulting from various groundwater observations that have been carried out across the site and in particular during the construction of the sports hall. The original borehole investigations carried out in the 1994 revealed a water table of around 125m above the Cyprus datum in the central area of the campus. Widespread borehole monitoring since 2003 has revealed that the groundwater level is fairly consistent in depth below the surface across the Kaloyeros/Vathys valley with a consistent hydraulic gradient (i.e. the slope of the groundwater surface) of 0.6% or 1:167 in a north easterly direction. In 2003/4 the level had risen to about 127m following prolonged periods of heavy rainfall. Pumping tests were carried out to calculate the best methods of dewatering building excavations and for the design of permanent dewatering facilities to safeguard the waterproofing of basements. Probably the most useful of the data produced is the fact that on average about 3300m³/day was pumped from the temporary excavations in order to achieve a local reduction in groundwater level. Although it would be dangerous to assume this level of groundwater availability across the whole site, it is clear that there are significant volumes of water available in the local alluvial gravels as suggested in the original infrastructure reports. This reinforces the original design concept of installing a string of well points to abstract the available groundwater and utilise it for irrigation, greywater and lake top up water. We recommend that the University re-visit this concept as part of the development of a workable strategy for the lakes, grey water and irrigation system.

12.07 Roads, Pavings, Parking and Access

Traffic and parking issues are dealt with in the Traffic and Transport section of the report. This section briefly considers the performance of installed road and parking infrastructure in terms of layout and structure, together with comments on the proposed extension of the road networks and parking in the southern area of the site.

Structurally, the road network appears to have performed well given that parts of the network have already been subjected to some fairly heavy construction traffic. A detailed condition survey was not carried out in the April 2008 visit but no damage or settlement was noted and no reports of failure were received from the CDO team. The only evidence of any failure or settlement in the various paved areas around the site was at the top of the steps adjacent to the Belvedere in the central area of the campus. There was evidence of settlement of the ground generally in this area and we suspect this may have been due to difficulties with compaction around the numerous service routes that rise up to belvedere level at this point. We assume that some remedial works will be carried out in this area to correct the settlement and remove any trip hazards in the steps or the paving.



Figure 4. South Western corner of the Masterplan showing possible re-alignment of new link road with reduced impact on Aronas Hill

The access points from the public highway system appear to have performed without incident although obviously predicted traffic flows have yet to be achieved and the influence of the diverted Agladjia-Yeri road will have a considerable impact on the traffic flows into the site. The roundabouts, which we recall were somewhat of a novelty in the late nineties in Cyprus, do not appear to have caused any difficulties. Part of the original access design thinking included the provision of security barriers at each of the entrances. As far as we are aware, this is still the long term intention, however it would be worth revisiting the access security issue in the light of the experience with security to date, the possible impact on traffic entering and passing the site and the type of access restrictions the future campus development might demand.

Once the northern access off the new bypass is constructed and traffic flows naturally adjust to suit, we would recommend a traffic safety audit is carried out to ensure that the road signage and road markings, forward visibility for drivers and visibility generally for pedestrians and cyclists is adequate and that calming and/or priority measures are put in place as appropriate to the amended flow of vehicles. In fact as the university gradually expands we suggest that if such a system is not already in place; regular audits are implemented to ensure that the traffic and pedestrian interfaces are safely managed to match the increased movements around the site. As mentioned under Traffic and Transport, the new northern entrance may become problematic if traffic using this entrance exceeds the capacity of the junction, particularly if security stops are envisaged. We recommend that if not instigated already, measures are put in place prior to the use of this entrance to manage the flows and adequately sign the preferred entrance locations for students staff and visitors. This would obviously require coordination with the Public Works Department in terms of the information to be shown on their road signage. We would suggest that a degree of flexibility is secured with the PWD for the off site signage in case the pattern of access varies from predictions and to accommodate the expanding campus population.

Moving to the southern masterplan proposals, from an engineering viewpoint, the provision of the new (public) southern link road and associated entrances to the southern campus area appears to be a logical proposal for developing this area of the site. Should much of this development be focused on commercial activity rather than educational, there may be a need to restrict commercial traffic use through the University campus to the north by some means otherwise this would add to potential conflicts with pedestrians and core University traffic.

Finally, we notice that the alignment of the new link road crosses some fairly steep ground at the foot of Aronas Hill and we suspect that in the final design this may be rationalised to a more northerly alignment to reduce gradients and avoid rock excavation etc. This may 'squeeze' the site edge northwards towards the internal access road and we suggest that this is considered in the further development of this area.

SECTION 12 APPENDIX

Sewage Treatment Plant Compound



Reference: Main compound
Condition: Excellent
Comments: Buildings house the majority of process equipment. The general layout is clear and accessible for maintenance.

Inlet Screen



Reference: Inlet screen
Condition: Satisfactory, but operation poor
Comments: The screen mechanism makes screenings removal a difficult and hazardous operation. UC requested an alternative automated unit.

Process: Screening
Type: 1nr rotary brush screen
Size: .
Motor: <0/18kW
Control: local panel
Comments: The screen rakes the screenings to a catch pit which then requires operator emptying and cleaning. This is a dirty operation which can be overcome with a new automated channel screen that will put screenings into a plastic bag and hence minimise operator contact with raw sewage.

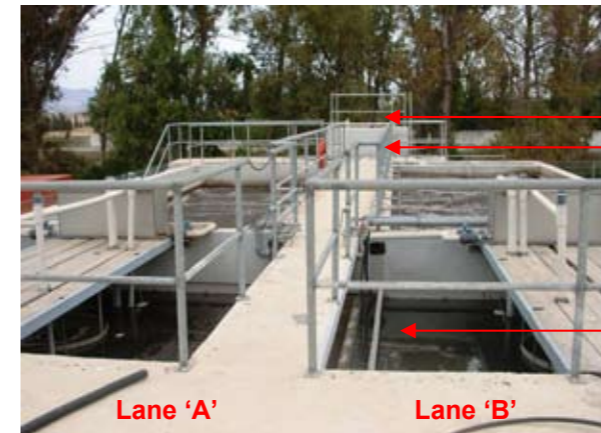
Raw Sewage Pumping Station



Reference: Pumping station
Condition: Good
Comments: Screened sewage enters into this chamber. There are 2nr pumps in service, with a spare connection to cater for future expansion. Odours are extracted (see later).

Process: Screened Sewage Pumping
Type: 2nr centrifugal submersible
Size: 20m3/hour
Motor: 4.7kW
Control: float switch
Comments: The pumps are over-sized in relation to daily flows, depending on level settings this can lead to stagnant conditions in the incoming sewer or increased pump wear due to multiple starts.

Main Treatment Tanks

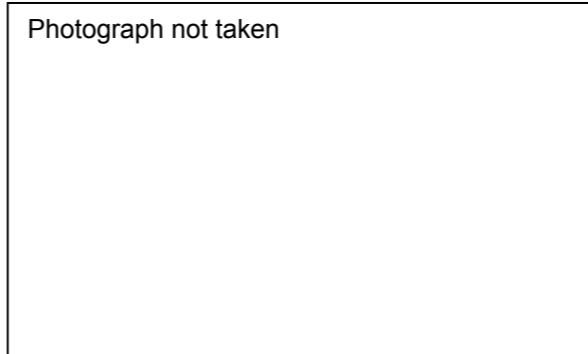


Reference: Main treatment tanks
Condition: Excellent
Comments: Reinforced concrete multi-compartment tanks, divided into two streams (Lane 'A' and Lane 'B').

Splitter chamber (Lane 'A' or 'B')
Grease traps

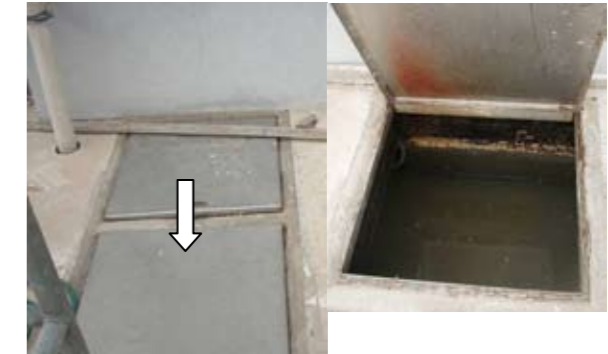
Aeration tank

Splitter Chamber



Reference: Splitter chamber
Condition: Satisfactory
Comments: The splitter chamber is used to divide flows equally to the two treatment lanes, and to allow a lane to be isolated for maintenance.

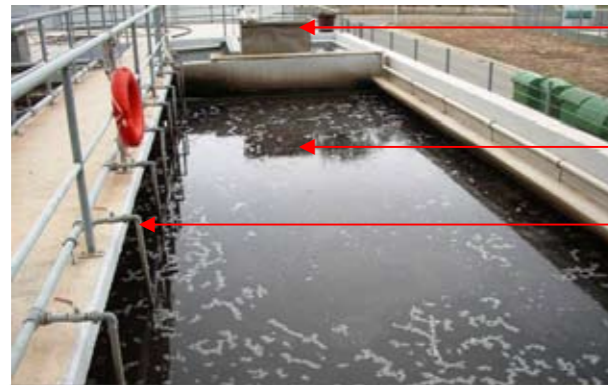
Grease Traps



Reference: Grease trap (2nr)
Condition: Satisfactory
Comments: Aerated grease traps used to separate grease prior to aeration stage. There are other grease traps for all buildings on the main site, hence these are under used.

Process: Grease separation
Tank size: 2nr 1.80 x 1.40 x 2.65m deep
Storage: 5.7m3 @ 2.25m TWL (each)
Comments: Limited use due to other grease traps outside main buildings at head of sewers - this is the preferred arrangement to prevent grease lining the pipes in the main sewer network and causing odours.

Aeration Tank



Sludge return
Main aeration basin
Air pipework to aeration diffusers

Reference: Aeration tank
Condition: Satisfactory
Comments: Aeration was satisfactory during inspection, biomass appeared in good condition and settleable.

Aeration Diffusers

Located below water level

Technical data
Aquadisc fine bubble diffusers
248mm diameter
EPDM perforated membrane
35 nr per aeration lane

Reference: Aeration diffusers
Condition: Unknown
Comments: Not visible, some areas showing over-aeration.

Process: Aeration tank
Tank size: 2nr 10.55 x 4.40 x 4.90m deep
Storage: 204m³ @ 4.4m TWL (each)
Comments: Aeration tank is over-sized for current flow rates. Single lane would be adequate. Two units suitable for future Phase 2 requirements.

Aeration Air Blowers



Reference: Aeration air blowers
Condition: Satisfactory
Comments: Blowers run 24 hours/day – no DO control.

Process: Aeration/sludge blowers
Type: 3nr + 1nr roots centrifugal
Size: (aeration) 228m³/hour at 490 mbar
(sludge) 100m³/hour at 490 mbar
Motor: 7.5kW + 3kW
Control: timer for duty rotation
Comments: Aeration blowers are over-run in relation to daily flows and loadings so that power efficiency is poor. Investigate dissolved oxygen control which will reduce power costs substantially.

Clarifier Tank



Reference: Clarifier (settlement) tank
Condition: Good
Comments: Diffuser drum and peripheral weirs in good condition. Settlement during inspection was effective despite high feed pump flow rate.

Process: Clarifier
Tank size: 2nr 4.40 x 4.40 x 4.90m conical
Storage: 43m³ @ 4.2m TWL (each)
Comments: Single clarifier would be adequate for current flow rates. Two units suitable for future Phase 2 requirements.

Intermediate Storage Tank

Concealed under filter building floor

Reference: Intermediate storage tank
Condition:
Comments:

Process: Intermediate storage tank
Tank size: 1nr 2.76 x 1.50 x 4.13m
Storage: 15m³ @ 3.7m TWL
Comments: Sized for future Phase 2 requirements.

Sludge Holding Tank

Concealed tank at end of aeration lane 'A'

Reference: Sludge holding tank
Condition:
Comments:

Process: Sludge holding tank
Tank size: 1nr 4.65 x 3.00 x 4.90m benched
Storage: 56m³ @ 4.2m TWL
Comments: Minimal use due to current loading rates producing small quantities of sludge for disposal.

Backwash Tank

Concealed tank at end of aeration lane 'B'

Reference: Backwash tank
Condition:
Comments:

Process: Backwash tank
Tank size: 1nr 4.65 x 5.85 x 4.90m benched
Storage: 114m³ @ 4.2m TWL
Comments: Regular use for backwashing filters. Sized for future Phase 2 requirements.

Filter Feed/Backwash Pumping Station



Reference: Filter feed pumping station
 Condition: Repairs in progress (P3 motor)
 Comments: These pumps feed/backwash the Culligan filters. During filtration there is 1nr pump in service. For the backwash cycle 2nr pumps operate together.

Process: Filter feed/backwash pumping
 Type: 3nr centrifugal (KSB)
 Size: 50m3/hour @ 30m head
 80m3/hour backwash
 Motor: 11kW
 Control: float switch
 Comments: These pumps are over-sized in relation to current daily flows, and during the backwash cycle with both pumps in operation for ~1hour there is about 80m3/day washwater generated compared to 35m3/day sewage inflows.

Filter Chemical Dosing



Reference: Filter chemical dosing
 Condition: Good
 Comments: 1st stage - Aluminium sulphate coagulant dosing. 2nd stage - Polymer dosing.

Process: Filter chemical dosing
 Type: 2nr diaphragm pump (Alldos)
 Size: Al 10 litres/hour coagulant (20ppm dose rate)
 Po 30 litres/hour polymer (3ppm neat polymer dose rate)
 Motor: 0.18kW
 Control: On during filter feed
 Comments: Pumps are operating for < 3hours due to current low flows. Intermittent use not beneficial for polymer dosing.

Culligan Filters



Reference: Culligan filters
 Condition: Good
 Comments: These filters are well maintained. The filter media has been changed since the original installation.

Process: Tertiary filtration
 Type: 2nr pressure filters (Culligan)
 Size: 50m3/hour @ 30m head
 80m3/hour backwash
 Motor: 11kW
 Control: Culligan PLC
 Comments: These Culligan OFSY WGR filters operate in series using a media of gravel and anthracite. The filters are part of an integrated Culligan package including the control panel.

Chlorination/Disinfection



Reference: Chlorination system
 Condition: Good
 Comments:

Process: Chlorination/disinfection
 Type: 1nr chlorine monitor (Alldos)
 2nr dosing pumps
 1nr recirculation pump
 Size: CaOH 7 litres/hour disinfectant
 Motor: 0.18kW
 Control: Alldos 2 –point controller
 Comments: The primary chlorine dose is the inlet of the Culligan filters and the residual setpoint dose is into the contact tank. The chlorine monitor is fed via a recirculation pump.

Chlorine Contact Tank

Concealed under filter building floor

Reference: Chlorine contact tank
 Condition:
 Comments:

Process: Chlorine contact tank
 Tank size: 1nr 6.75 x 2.29 x 4.13m
 Storage: 56m3 @ 3.7m TWL
 Comments: Sized for future Phase 2 requirements. Based on 1 hour contact time

Irrigation Tank

Concealed under filter building floor

Reference: Irrigation tank
 Condition:
 Comments:

Process: Irrigation tank
 Tank size: 2nr 13.00 x 4.13 x 4.13
 Storage: 196m3 @ 3.65m TWL (each)
 Comments: Two compartment (A & B) tank with borehole incoming supply connection into compartment 'A'. Sized for future Phase 2 requirements.

Irrigation Pumps



Reference: Irrigation pumping station
Condition: Good
Comments: These pumps feed the site irrigation network.

Process: Irrigation pumping
Type: 4nr multi-stage (KSB)
Size: 20m³/hour @ +60m head
Motor: 18kW inverter
Control: float switch
Comments: These pumps run as a single pump duty with the other three on standby, each pump being brought on-line to match irrigation system demands. Sized for future Phase 2 requirements.

Irrigation Control



Reference: Irrigation control system
Condition: Excellent
Comments: Irrigation network comprises 500 node setup, with 133 solenoid valves in current use. Valve control via a profibus network cable.

Control Panels



There are several separate control panels provided as listed below:

- CP.1 Inlet screen panel
- CP.2 STP panel – will require duplication for Phase 2 requirements
- CP.3 Tertiary filter
- CP.4 Irrigation pumps panel

Odour Control



Reference: Odour control
Condition: Excellent
Comments:

Process: Odour control
Type: Activated carbon filter
Size: 685m³/hour fan
Motor: 1.5kW
Control: time switch
Comments: The single vent fan extracts foul air from the raw effluent pumping station, grease traps and inlet splitter chamber. Sized for future Phase 2 requirements.

Standby Generation



Reference: Generator
Condition: Excellent
Comments: This unit has not been used other than for test runs. Sized for future Phase 2 requirements.

Process: Standby generator
Type: Diesel
Size: 150KVA
Motor: auto-start
Comments: The maximum installed capacity is assessed at 110kW. Sized for future Phase 2 requirements.

13.0 STRUCTURAL ENGINEERING REPORT

13.01 Site Geology

The Civil Engineering report for the Masterplan of August 1994 identified that the geology consists of sandy, silty, gravelly alluvial deposits on the flat bed of the Kaloyeros river valley some 6 to 8m thick. To the north the higher ground consists of cemented gravels, cobbles and sand overlying dense silty clay or marl which is exposed in the sloping escarpment running parallel to the river defining the northern edge of the valley. The marl bedrock extends under the alluvial river bed deposits and becomes exposed again on the south of the valley.

The tendency of the marl to shrink and heave when subject to moisture variation will greatly influence both the foundation design and the general earthworks.

The report recommended the adoption of a standard piled foundation type for the major buildings. For single storey buildings and small isolated structures piled foundations were recommended but raft solutions may be possible.

13.02 Substructure - Performance of Existing Foundations

The Pure and Applied Sciences building has foundations that consist of 12m - 20m long bored friction piles. The ground floor was suspended and polystyrene placed under the ground beams to prevent heave of the underlying marl affecting the structure.

On the Administration building, strip foundations were adopted. The building has a basement and the foundation level is consequently 8m below ground level. In addition a 1m thick layer of marl beneath the building was removed and replaced with suitably compacted material. Strip foundations were also adopted for the three or four storey Student Residences (Phase 1a).

The Store Facilities consist of a single storey steel portal frame building and isolated concrete pad bases were used for this and other services buildings.

The indoor Sports Hall has two basements and a raft foundation was used with foundation level 9m below ground. In the cases of both the Administration Building and the Sports Hall difficulties were experienced with ground water during construction and a de-watering system was installed to control the water levels. The Energy Centre and EAC Primary Sub-station are single storey buildings that have isolated pad bases connected by ground beams.

Cracking of the masonry has been experienced in the Student Residences and the services buildings as a result of heave or shrinkage of the underlying marl. Some settlement has occurred on an external staircase in the Pure and Applied Sciences Faculty which was founded on up to 10-12m of compacted backfill.

Where suspended ground floors with compressible board beneath them were used on the Pure and Applied Sciences buildings, no difficulties have been experienced with heave or shrinkage of the underlying marl.

13.03 Substructure - Recommendations

For multi-storey buildings located within the Kaloyeros river valley and directly on the marl bored friction piles should be used for the foundations. Where marl is close to the surface sleeved piles and suspended ground floors must be adopted to avoid the effects of heave and shrinkage referred to above. For single storey buildings conventional strip and pad foundations can be used where appropriate.

The anticipated behaviour of the underlying strata of an earthquake must be considered in the structural design.

There is no ground water aquifer beneath the site although it is likely that a perched water table exists in the alluvial deposits in the valley floor. Designers should refer to the latest ground water records, piezometer and stand pipe readings to assess the possible implications for foundation designs particularly where basements are proposed.

Basements should be designed to be fully water resistant both to the possible ingress of ground water and the effects of surface water from the surrounding areas.

13.04 Superstructure - Structural Design Guidelines

The majority of the buildings constructed to date are in-situ reinforced concrete beam and slab construction. All the buildings are currently designed in accordance with the Cyprus Earthquake Code. Lateral stability is provided by cast in-situ reinforced shear walls to resist the seismic forces.

It is likely that Eurocodes will be adopted in the next 2 to 3 years and there will be a further period when both the Eurocodes and the existing Cyprus Codes are acceptable. For future structures the use of Eurocode 2 - The Design of Concrete Structures and Eurocode 8 - The Design Structures for Earthquake resistance is recommended. The use of these Codes may result in significant economies in the construction of both the sub-structure and the super-structure of future buildings.

14.00 COST REPORT

14.01 Basis of Pricing

Future Projects:

The Cost Plan is based on prices for the resources of construction current during December 2008. No allowances have been included for the effect of any future changes in base costs due to inflation, or for the effect which any change in the level of activity of the construction industry of Cyprus may have on tender levels.

Projects under construction:

The Cost Plan provides for prices and projection of cost until the time of completion of these projects, based on the Contract Sum.

Completed Projects:

The Cost Plan provides for prices and costs based on the final accounts of these projects.

Exclusions :

The Cost Plan excludes the following:-

- VAT or other similar taxes beyond the current rate of 15%.
- Import duties.
- Legal and management expenses.
- Land acquisition costs.

- Any contributions towards the cost of works beyond the site, such as:-
 - bringing water, power, telecommunications, etc. to the boundary of the site (including the provision of any primary (66KV-11KV) transmission station that may be required on the site)
 - taking sewage from the site
 - realignment of nearby roads

- Any costs associated with the relocation of existing properties within, or immediately adjacent to, the site such as:-
 - Athalassa farm
 - Army camp
 - Government or UN checkpoints
 - Rerouting the electricity supply (including the removal of existing overhead pylons)

- Equipment for teaching and research.

14.02 Pricing Levels:

Cyprus Construction Industry has experienced a tremendous increase in the overall cost of construction for building works (following accession to the EU) particularly during the period 2003 – 2006 where the cost index has increase by:-

2003	-	9.4%
2004	-	14.9%
2005	-	12.1%
2006	-	6.6%
2007	-	5.2%
2007	-	6.0% (predicted)

The above abnormal cost increases are in general responsible for the increases in budget costs that have incurred on certain projects so far, since the commencement of the University Campus.

At the moment it appears that the construction cost inflation for building projects is running at around 5% per annum.

It should be noted, however, that under the present worldwide unstable financial conditions the above provision may vary.

14.03 Comparison of Current and Previous Cost Plans:

It should be noted that the Current Cost Plan provides for certain items of cost that were excluded from previous Cost Plans. Further, the previous Cost Plan was for a University size of 8,000 FTE, whereas the current one is for 10,000 FTE. Therefore, before any direct comparison can be made a proper adjustment of the figures will be required.

Future Projects Cost :

The Cost of Future Projects reflects any necessary costs attributed to the specific conditions of developing projects on the University Campus and the knowledge gained from previous projects.

14.04 Preliminary Cost Plan

Currency All costs are in Euros
Preliminary cost plan on following pages..

UNIVERSITY OF CYPRUS
 ATHALASSA CAMPUS
 Completed / Under Construction / Future Projects

PRELIMINARY COST PLAN REVISION N NOVEMBER 2008
 BUILDINGS / INFRASTRUCTURE
 for 10.000 FTE

No.	Building No.	Faculties, Depts, Centres & Infrastructure	Year				Target Gross Areas - m2			€/m2 (for PRK: € /space)	Estimated Cost - Euros		
			Actual constr Compltn	Anticipated constr Compltn	Expected Start Constr	Estimated compltn constr	Completed Buildings / Infrastructure (m2)	Under Construction m2	Future Phases for 10.000 FTE m2 subtotal / total		Completed Projects & Awarded Contracts €	Under Construction €	Future Phases for 10.000 FTE €
COMPLETED PROJECTS													
1		External Works & Services											
	1.1	Enabling works	1998									327,385	
	1.2	Infrastructure - Phase 1	2001									6,612,392	
	1.3	External Services	2001									2,470,638	
	1.4	Drainage & Sewage Treatment Plant											
	STP 01/2	Sewage Treatment Plant	2001				393					956,817	
2		Parking											
	PRK 02	Open Air Parking (325 spaces)	325	2001					2,563			832,975	
	PRK 03	Open Air Parking (142 spaces)	142	2001					2,563			363,946	
		Temporary Parking	500	2006								139,279	
3		Maintenance & Service Facilities											
	STP 04	Chemical and garden store	2002				500					512,580	
	SBD 01/2	External areas service buildings											
	SBD 04	Central Stores					1,502					1,156,156	
	SBD 05	Facilities Management Unit					1,065						
	SBD 03	Workshops					502						
	ENC 01	Energy Centre	2002										
		Central Plant					593						
		Oil Tanks					390					629,000	
		Pump Room					92						
	SPF 03	EAC Electricity Primary Substation	2002				235	4,879		573		134,600	
4		Campus Site Office											
	CSO 01	Campus Site Office, later CDO	2003				363					361,042	
5.1		Faculty of Pure & Applied Sciences - Phase 1											
	FST 01	Mathematics & Statistics & Computer Sc.	2003				8,849			871		7,710,901	
	FST 02	Physics & Chemistry & Biology	2004				10,391	19,240		998		10,370,157	

UNIVERSITY OF CYPRUS
ATHALASSA CAMPUS
Completed / Under Construction / Future Projects

PRELIMINARY COST PLAN REVISION N NOVEMBER 2008
BUILDINGS / INFRASTRUCTURE
for 10.000 FTE

No.	Building No.	Faculties, Depts, Centres & Infrastructure	Year				Target Gross Areas - m2			€/m2 (for PRK: € /space)	Estimated Cost - Euros		
			Actual constr Compltn	Anticipated constr Compltn	Expected Start Constr	Estimated compltn constr	Completed Buildings / Infrastructure (m2)	Under Construction m2	Future Phases for 10.000 FTE m2 subtotal / total		Completed Projects & Awarded Contracts €	Under Construction €	Future Phases for 10.000 FTE €
5.2	CTF 01	Central Academic Resources - Phase 1 Common Teaching 1	2003				2,868			788	2,261,065		
6	SRA 00-14	Residential Accommodation - Phase A 1a Housing - 208 rms (incl. external works)	2003-4				6,555			1,103	7,228,680		
7	ADM 01	Central Support Facilities Administration University House (incl. external works) Service Road (Part 1)	2005				10,000			1,186	11,859,085		
8		Bus Stops Bus Stops (2 on North loop & 1 at NE entrance)	2005								208,005		
9.1	SPF 02	Sports Facilities - Buildings & Fields - Phase 1 Changing facilities & Control Points	2006				110						
	SPF 08-15&20	Outdoor Sports Fields Linear Park											
9.2	PRK 05	Sports Parking Open Air PRK (124 spaces)	124	2007			7,110						
9.3	SPF 01	Indoor Sports Hall Overfly bridge		2008			325	7,435			16,402,574		
PROJECTS UNDER CONSTRUCTION													
10	FST 02	Faculty of Pure & Applied Sciences - Phase 2 EXT Science & Temporary Biology		2009				2,657		2,149	1,560,703	4,149,443	
11.1	FEB 01	Faculty of Economics & Management Public & Business Administration		2010			5,772						
	FEB 02	Economics					4,013	9,785		1,149			
11.2	CTF 02	Central Academic Resources - Phase 2 Common Teaching 2		2010				7,637		1,220	9,578,045	10,982,633	
12	SFC 00	Central Support Facilities Social Facilities Centre Central Square & External Works		2010			2,750	11,990		1,280	4,147,717	15,352,283	

UNIVERSITY OF CYPRUS
ATHALASSA CAMPUS
Completed / Under Construction / Future Projects

PRELIMINARY COST PLAN REVISION N NOVEMBER 2008
BUILDINGS / INFRASTRUCTURE
for 10.000 FTE

No.	Building No.	Faculties, Depts, Centres & Infrastructure	Actual constr Compltn	Anticipated constr Compltn	Year		Target Gross Areas - m2			€/m2 (for PRK: € /space)	Estimated Cost - Euros			
					Expected Start Constr	Estimated compltn constr	Completed Buildings / Infrastructure (m2)	Under Construction m2	Future Phases for 10.000 FTE m2 subtotal / total		Completed Projects & Awarded Contracts €	Under Construction €	Future Phases for 10.000 FTE €	
FUTURE PROJECTS														
13		Learning Resource Centre												
	LRC 01	LRC			2009	2012				15,161	2,700			40,934,700
14		Shadings - Belvedere & Pedestrian routes			2009	2009				tbc				85,500
15		Parking			2010	2011								
	PRK 04	Sports Parking (Multi-Storey 320 spaces)	620								14,500			8,990,000
	PRK 20	South West area parking Multi Storey	750								14,500			10,875,000
		South West Infrastructure extension									tbc			85,500
16		Faculty of Engineering			2011	2015								
	ENG 01	Engineering: Phase 1 (Engineering)								22,001	1,950			42,901,950
	PRK	Parking under ENG 01	100								17,600			1,760,000
		Linking Infrastructure for 2nd Energy Centre)				
16.1	ENC 02	Energy Centre 2			2012	2013)	4,873	600		2,923,800
		2nd Lake (Heat sink))				
17.1		Faculty of Pure & Applied Sciences												
	FST 03	Biology: Phase 1			2011	2014				5,636	1,950			10,990,200
	FST 03	Biology: Phase 2			2015	2017				1,590	1,950			3,100,500
											7,226			
17.2		Central Academic Resources - Phase 3			2011	2014								
	CTF 03	Common Teaching 3									4,556	1,350		6,150,600
18		Faculty of Pure & Applied Sc. - Refurbishment												
		Science except Biology - Refurbishment			2014	2015					2,657	675		1,793,475
19		Residential Accommodation - Phase 1B												
		Plot 17 Southern Area												
	SRB	1b Housing 380 rms			2012	2015					15,000	1,325		19,875,000
		Southern Infrastructure Extension (West)			2012	2015								5,000,000
	PRK	1B Parking (surface under trees)	220		2012	2015					2,150			473,000
20		Faculty of Medicine												
	MMB 01	Pre-clinical medicine			2014	2017					7,795	1,525		11,887,375
		Clinical Medicine - Off Campus			2014	2017					8,228	1,350		11,107,800
21		Cultural Square			2011	2012								187,496

UNIVERSITY OF CYPRUS
ATHALASSA CAMPUS
Completed / Under Construction / Future Projects

PRELIMINARY COST PLAN REVISION N NOVEMBER 2008
BUILDINGS / INFRASTRUCTURE
for 10.000 FTE

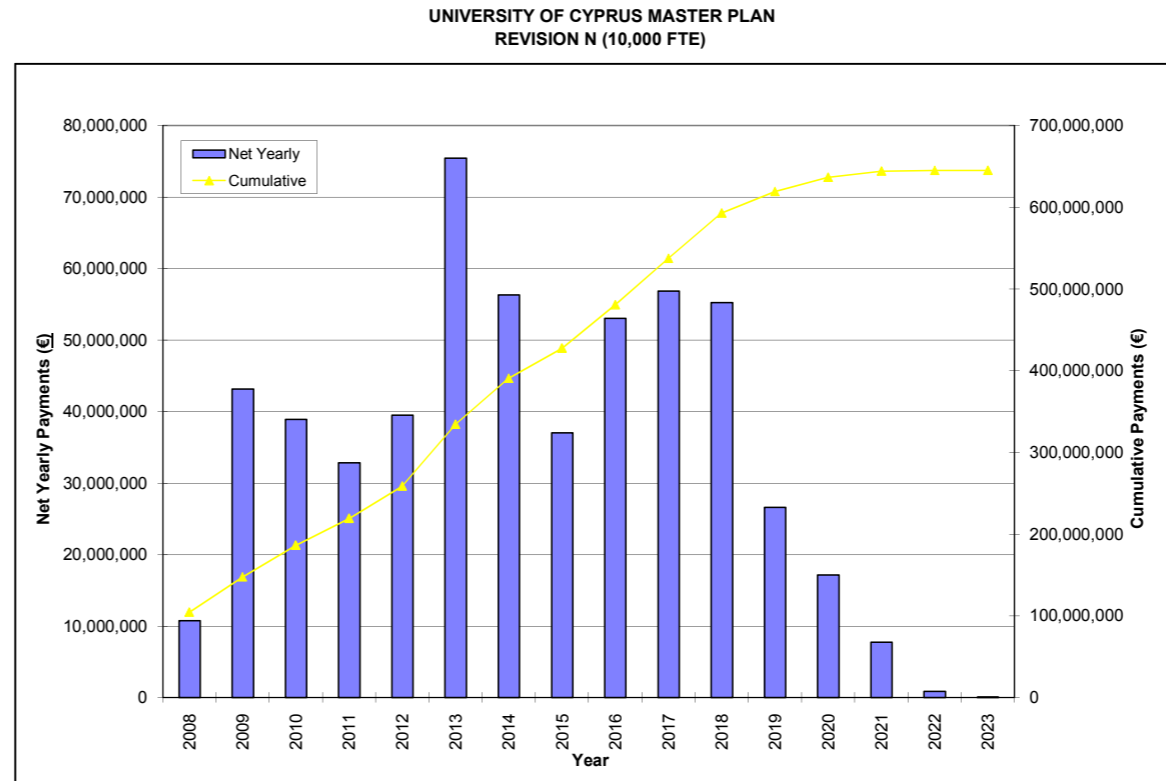
No.	Building No.	Faculties, Depts, Centres & Infrastructure	Actual constr Compltn	Year		Target Gross Areas - m2			€ /m2 (for PRK: € /space)	Estimated Cost - Euros		
				Anticipated constr Compltn	Expected Start Constr	Estimated compltn constr	Completed Buildings / Infrastructure (m2)	Under Construction m2		Future Phases for 10.000 FTE m2 subtotal / total	Completed Projects & Awarded Contracts €	Under Construction €
22.1	LTR 01	Faculty of Letters			2012	2014			5,266	1,275		6,714,150
22.2	HUM 01	Faculty of Humanities			2012	2014			4,853	1,275		6,187,575
		Turkish Studies										
		Foreign Languages & Literature										
23.1	CTF 04	Central Academic Resources Common Teaching 4			2014	2017			3,024	1,350		4,082,400
23.2	SCE 01	Faculty of Social Sciences & Education										
		Social & Political Sciences										
		Education			2014	2017			8,757	1,275		11,165,175
		Language Centre							1,000	1,275		1,275,000
23.3	LAW 01	Faculty of Law Law			2014	2017			2,417	1,350		3,262,950
24		Residential Accommodation - Phases 3 & 4										
		North Western and North Boundary										
	SRC	2a Housing 390 rms			2012	2015			13,780	1,325		18,258,500
	SRD	2b Housing 390rms			2016	2018			13,780	1,325		18,258,500
	SRE	2c Housing - 195 rooms			2018	2021			6,890	1,325		9,129,250
25		Parking										
		North Western and North Boundary										
	PRK 06	Perimeter PRK decked (440 spaces)	440		2012	2015				14,500		6,380,000
	PRK 09	Perimeter PRK decked (220 spaces)	220		2012	2015				14,500		3,190,000
	PRK 10	Perimeter PRK decked (320 spaces)	320		2012	2015				14,500		4,640,000
	PRK 11	Perimeter PRK decked (700 spaces)	700		2016	2018				14,500		10,150,000
	PRK 12	Perimeter PRK decked (520 spaces)	520		2018	2021				14,500		7,540,000
26		Central Support Facilities										
	CLC 01	Cultural Centre			2015	2019			15,911	2,075		33,015,325
	CLC 02											
	PRK	Parking under CLC 01 (2 basements)	430							17,600		7,568,000
27		Sports Facilities - Phase 2										
		Stadium, Fields & Swimming Pool										
	SPF 04	Stadium										
	SPF 05	Athletics stadium seating										4,271,504
	SPF 06	Football seating & Changing facilities			2015	2016						
	SPF 07&16-19	Outdoor sports fields										
	SPF 21	Outdoor Swimming pool										1,351,931
28	ENG 02	Faculty of Engineering - Phase 2 Architecture or Extension of Engineering			2016	2018			3,273	1,525		4,991,325

14.05 Cash Flow Summary

UNIVERSITY OF CYPRUS MASTER DEVELOPMENT PLAN
REVISION N (10,000 FTE)

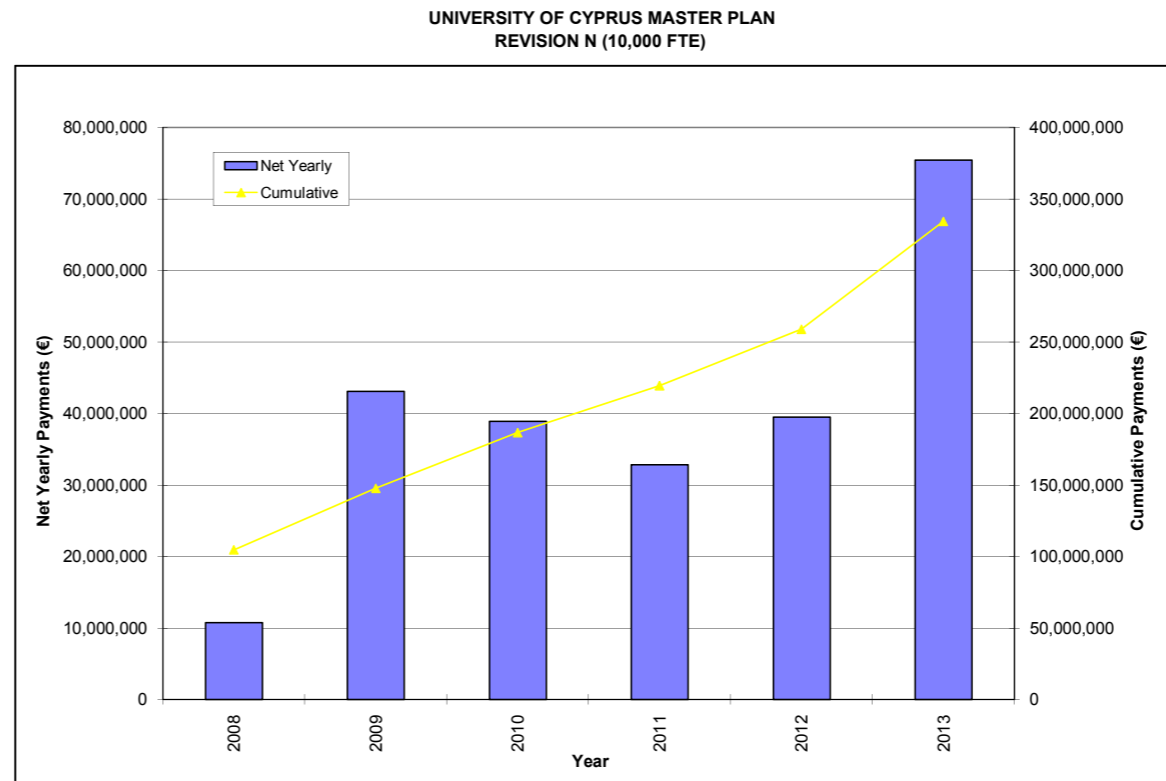
Year	Net Yearly	Cumulative
	Euro	Euro
Completed 1999 - 2007	93,891,953	93,891,953
2008	10,728,785	104,620,738
2009	43,115,869	147,736,607
2010	38,906,385	186,642,992
2011	32,847,510	219,490,502
2012	39,505,194	258,995,696
2013	75,414,543	334,410,240
2014	56,314,717	390,724,956
2015	37,024,717	427,749,673
2016	53,002,387	480,752,060
2017	56,835,263	537,587,323
2018	55,248,949	592,836,271
2019	26,584,379	619,420,650
2020	17,156,595	636,577,245
2021	7,732,301	644,309,545
2022	873,763	645,183,308
2023	50,600	645,233,908

14.06 Cash Flow Graphs



graph all years

12/01/2009



14.07 Specification Notes and Assumptions

Generally:

It has been assumed that the majority of the buildings will utilize well tried local construction methods and local materials. Some of the buildings, particularly those that will be used by the public or for conferences are assumed to be of higher quality and these are specifically indicated below.

It has been assumed that up to 2008 the buildings will be of low-rise construction (rarely more than three storeys high) following the slopes of the existing ground, naturally lit where possible and of shallow depth: the proliferation of smaller rooms has been noted. There is a recent government town planning decision allowing a relaxation in the heights of buildings, with the result that new projects could be higher than the current allowance of three storeys.

Substructure:

Raft foundations and / or deep bored piling due to poor ground conditions, possibly combined with thermal piping loops.

Ground bearing slabs of reinforced concrete laid on polystyrene compressible boards and granular beds covered with a polythene damp proof membrane.

Frame:

Generally reinforced concrete; the prices would allow for columns and beam construction with non-load bearing clay block external and core walls or for solid reinforced concrete external and core walls.

Parts requiring unobstructed clear area are assumed to be constructed with high quality decorated structural steel and cladding.

Upper Floors:

In situ reinforced concrete.

Roofs:

Generally reinforced concrete with bitumen waterproofing and thermal insulation.

Sports facilities areas are structural steel with insulated cladding.

Rainwater pipes and gutters generally would be of plastic or metal.

Stairs:

Generally in-situ or precast reinforced concrete; mild steel balustrades with plastic covered handrails: some special stairs may be of steel or stainless steel construction.

External Walls:

See Frame above: walls would be fair face or insulated rendered externally in accordance with local tradition but the prices allow for some walls to be finished with a superior finish such as local stone, tiles, marble etc. and for some ground floor elevations to have a high proportion of glazed screens with opening elements. There is an allowance for increased levels of thermal insulation in accordance with current EU regulations.

Windows and External Doors:

Locally fabricated double glazed aluminium; the prices allow for a large proportion of external doors to be double glazed.

Internal Partitions:

Locally fabricated clay blocks; dry lined and insulated partitions, and some glazed screens.

Internal Doors:

Painted plywood faced flush doors generally with veneered flush doors in superior areas: painted softwood frames and linings.

Wall Finishes:

Emulsion paint on plaster; ceramic tiles in wet areas.

Floor Finishes:

Vinyl sheet generally, medium quality carpet in offices and similar areas, local tiles or other hard surfaces in principal circulation areas.

Ceiling Finishes:

Mineral fibre or plasterboard suspended ceilings in offices, classrooms and similar areas with integral lighting and extract systems.

Finishes Generally:

The prices would allow for a proportion of higher quality finishes in the main entrance and other areas used by the public or for conferences.

Fittings:

The prices allow for a small proportion of the fittings to be build-in; the majority of the fittings are expected to be covered by a Building Equipment budget.

Public Health Installations:

Standard white vitreous china WCs, hand basins, shower basins and urinals, pressed steel baths, stainless steel sinks, chromium plated taps: plastic waste pipes and fittings: copper water distribution pipework.

External Areas:

Provisions have been made for extensive external hard surfaces and shaded landscaping areas with each project site.

Heat Source:

Remote central oil-fired boiler house with hot water distributed throughout the main site by a ring main with individual heat exchanges to provide local hot water in each building; pumps; oil storage tank for domestic hot water supply. Solar collectors will supplement the heating source.

Residential accommodation would have individual meter controlled electric heaters: as an alternative each block may be served by oil-fired boilers providing hot water distribution to radiators installed in every room with individual meter control, this system would also provide a continuous hot water supply.

Space Heating, cooling and Air Treatment :

Low pressure hot water radiators generally for use during winter: most accommodation will be fitted with air-conditioning systems, the extent of utilization being minimized by the maximum use of building fabric: living areas of residential accommodation will be air-conditioned with cooling equipment elsewhere. Energy conservation systems will be included.

Ventilating System:

Extract ductwork from internal toilets and bathrooms, kitchen and laboratories.

Electricity Installations:

Main power distribution by ring main around main site with separate supply to residential area: main cabling and distribution boards within individual buildings: small power installation, wiring to mechanical services, internal and emergency lighting: separate heavy power installation to Engineering Department.

Protective Installations:

Fire alarms, fire extinguishing equipment; security installation; lightning protection.

Communication :

Central EPABX telephone installation with distribution wiring to individual buildings, telephone conduit within buildings; it is expected that final wiring and handsets would be covered by a Building Equipment budget.

Ducts and conduits for computer network, it is expected that wiring and computer stations would be covered by a Building Equipment budget.

Builder's Work in Connection with Services Installations :

All normal holes, ducts, chases etc, including provision of access chambers at regular intervals.

Site Works :

See item 8.1 of Preliminary Cost Plan.

Sports Facilities:

See item 5 / Buildings and item 7 / Playing Surfaces of Preliminary Cost Plan.

Particular Areas**School with scientific orientation :**

These areas include for a higher proportion of built-in fittings, such as laboratory benches, fume cupboards, etc. and higher levels of specialist services.

Miscellaneous Research Centres :

These areas include for a higher proportion of built-in fittings and for the buildings to be adequately air-conditioned and ventilated

Learning Resource Centre (LRC) :

This area is now fully designed, and the estimated cost includes for all facilities, special features and specification levels as indicated in the

detailed design documents.

Common Teaching Area/ Lecture Theatres::

These areas include standard lecture room seating and for air-conditioning of the whole building. The price does not allow for sophisticated audio / visual lecture aids.

It has been assumed that approximately one-third of the accommodation will be finished to a superior standard to allow for its use as a conference facility during the vacations.

Computer Centre:

The majority of these areas will have a raised access floor and will be fully air-conditioned.

Educational Technology Centre:

This area includes a higher proportion of built-in fittings and will be fully air-conditioned.

Language Centre:

This area includes a higher proportion of built-in fittings and for partial air-conditioning.

Central Support Facilities:

The staff areas of these buildings would be air conditioned.

Servery equipment and similar specialist items are included in the price for Central Dining.

Cooking equipment is included in the price of Central Kitchens.

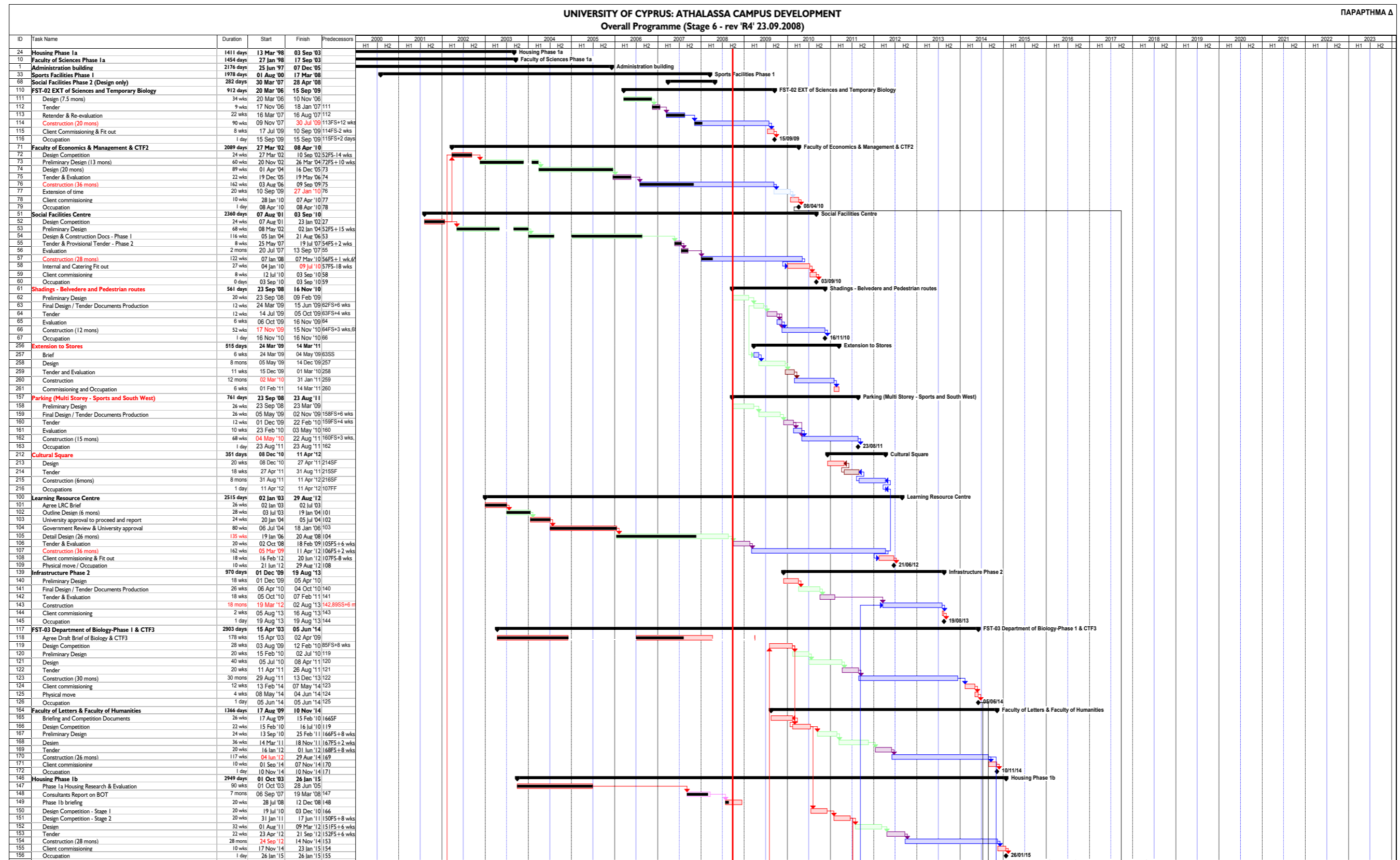
Maintenance and Service Facilities:

These buildings will be of a simple light industrial construction appropriate to their purpose, with concrete frame, blockwork walls etc.

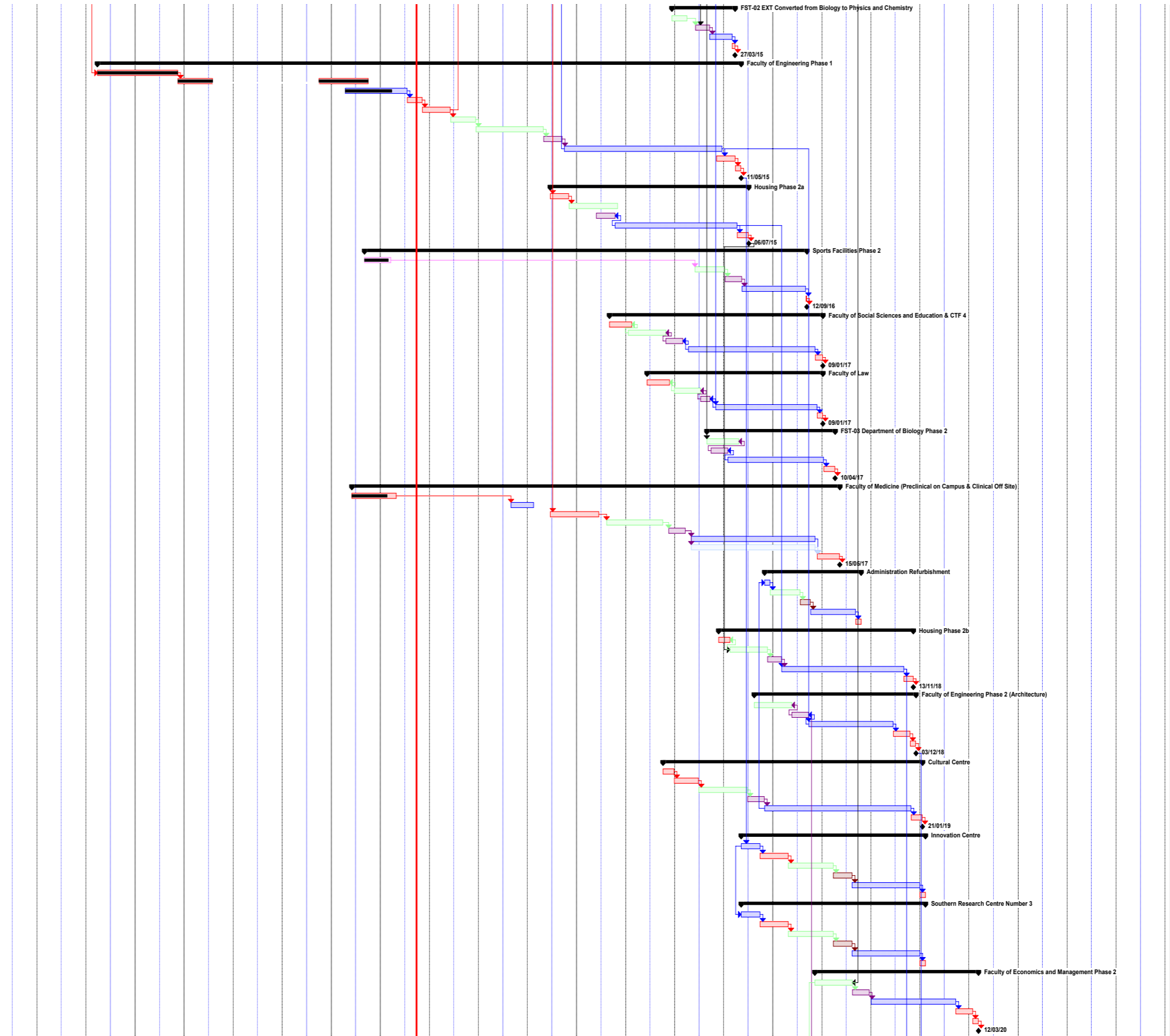
Residential Accommodation:

Residential accommodation will consist of individual bedrooms with private en-suite facilities, and will be air-conditioned.

APPENDIX A Development Programme



133	FST-02 EXT Converted from Biology to Physics and Chemistry	337 days	12 Dec '13	27 Mar '15
134	Design	16 wks	12 Dec '13	02 Apr '14
135	Tender	15 wks	06 Jun '14	18 Sep '14/134,126
136	Construction (4 mos)	120 days	19 Sep '14	05 Mar '15/135
137	Client Commissioning	3 wks	06 Mar '15	26 Mar '15/136
138	Occupation	1 day	27 Mar '15	27 Mar '15/137
80	Faculty of Engineering Phase 1	3416 days	27 Mar '02	11 May '15
81	Agree Draft Brief	85 wks	27 Mar '02	14 Nov '03/7255
82	Approvals to proceed with draft brief	89 wks	17 Nov '03	03 Oct '07/81
83	Brief Development	66 wks	16 Apr '07	18 Jul '08
84	Produce competition documents, set up jury etc	16 wks	21 Jul '08	07 Nov '08/83
85	Design Competition, appointment, decision to proceed	30 wks	10 Nov '08	05 Jun '09/84
86	Preliminary Design (6 mos)	27 wks	08 Jun '09	11 Dec '09/85
87	Design (18 mos)	18 mos	14 Dec '09	29 Apr '11/86
88	Tender & Evaluation	20 wks	02 May '11	16 Sep '11/87
89	Construction Period Phase 1 (42 mos)	42 mos	03 Oct '11	19 Dec '14/88FS+2 wks
90	Client Commissioning phase 1	20 wks	10 Nov '14	27 Mar '15/89FS-6 wks
91	Physical Move phase 1	6 wks	30 Mar '15	08 May '15/90
92	Occupation phase 1	1 day	11 May '15	11 May '15/91
173	Housing Phase 2a	1056 days	20 Jun '11	06 Jul '15
174	Agree brief	20 wks	20 Jun '11	04 Nov '11/151
175	Design	52 wks	07 Nov '11	02 Nov '12/174
176	Tender	20 wks	28 May '12	15 Oct '12/177SF
177	Construction	130 wks	15 Oct '12	10 Apr '15
178	Phase 2a Client Commissioning	12 wks	13 Apr '15	03 Jul '15/177
179	Phase 2a Occupation	1 day	06 Jul '15	06 Jul '15/178
44	Sports Facilities Phase 2	2353 days	06 Sep '07	12 Sep '16
45	Consultants Report on BOT	7 mos	06 Sep '07	19 Mar '08
46	Design	32 wks	02 Jun '14	09 Jan '15/45
47	Tender	18 wks	12 Jan '15	15 May '15/46
48	Construction of Stadium & Other	68 wks	18 May '15	02 Sep '16/47
49	Client commissioning	1 wk	05 Sep '16	09 Sep '16/48
50	Occupation	1 day	12 Sep '16	12 Sep '16/49
180	Faculty of Social Sciences and Education & CTF 4	1136 days	03 Sep '12	09 Jan '17
181	Design Competition	24 wks	03 Sep '12	15 Feb '13/182SF-5 wks
182	Design	40 wks	21 Jan '13	28 Oct '13/183SF
183	Tender	18 wks	28 Oct '13	03 Mar '14/184SF-6 wks
184	Construction (30 mos)	135 wks	14 Apr '14	11 Nov '16
185	Client commissioning	8 wks	14 Nov '16	06 Jan '17/184
186	Occupation	1 day	09 Jan '17	09 Jan '17/185
187	Faculty of Law	936 days	10 Jun '13	09 Jan '17
188	Design Competition	24 wks	10 Jun '13	25 Nov '13/189SF-5 wks
189	Design	28 wks	30 Dec '13	14 Jul '14/190SF
190	Tender	10 wks	14 Jul '14	22 Sep '14/191SF-6 wks
191	Construction (24 mos)	108 wks	03 Nov '14	25 Nov '16/170FS+9 wks
192	Client commissioning	6 wks	28 Nov '16	06 Jan '17/191
193	Occupation	1 day	09 Jan '17	09 Jan '17/192
127	FST-03 Department of Biology Phase 2	682 days	29 Aug '14	10 Apr '17
128	Design	34 wks	29 Aug '14	23 Apr '15/128SF,126FS
129	Tender	18 wks	29 Sep '14	02 Feb '15/130SF
130	Construction	102 wks	02 Feb '15	13 Jan '17
131	Client Commissioning	12 wks	16 Jan '17	07 Apr '17/130
132	Occupation	1 day	10 Apr '17	10 Apr '17/131
202	Faculty of Medicine (Preclinical on Campus & Clinical Off Site)	2596 days	04 Jun '07	15 May '17
203	Preliminary Work by Consultants	47 wks	04 Jun '07	28 Apr '08
204	Brief Development	24 wks	01 Sep '10	15 Feb '11/203
205	Design Competition	52 wks	20 Jun '11	15 Jun '12/151
206	Design	40 wks	13 Aug '12	04 Oct '13/205FS+8 wks
207	Tender	18 wks	18 Nov '13	21 Mar '14/206FS+6 wks
208	Construction Preclinical Medicine - Off Site	132 wks	05 May '14	11 Nov '16/207FS+6 wks
209	Construction Clinical Medicine - Off Site	132 wks	05 May '14	11 Nov '16/207FS+6 wks
210	Client commissioning	24 wks	28 Nov '16	12 May '17/208FS+2 wks
211	Occupation	1 day	15 May '17	15 May '17/210
296	Administration Refurbishment	515 days	02 Nov '15	20 Oct '17
297	Brief	6 wks	02 Nov '15	11 Dec '15/199SS
298	Design	8 mos	14 Dec '15	22 Jul '16/297
299	Tender and Evaluation	11 wks	25 Jul '16	07 Oct '16/298
300	Construction	12 mos	10 Oct '16	08 Sep '17/299
301	Commissioning and Occupation	6 wks	11 Sep '17	20 Oct '17/300
217	Housing Phase 2b	1036 days	25 Nov '14	13 Nov '18
218	Agree Brief	12 wks	25 Nov '14	17 Feb '15/219SF
219	Design	40 wks	17 Feb '15	23 Nov '15/179FS-20 wks
220	Tender	15 wks	24 Nov '15	07 Mar '16/219
221	Construction	130 wks	08 Mar '16	03 Sep '18/220,177
222	Phase 2a Client Commissioning	10 wks	04 Sep '18	12 Nov '18/221
223	Phase 2a Occupation	1 day	13 Nov '18	13 Nov '18/222
93	Faculty of Engineering Phase 2 (Architecture)	861 days	17 Aug '15	03 Dec '18
94	Design	40 wks	17 Aug '15	23 May '16/95SF
95	Tender	18 wks	23 May '16	26 Sep '16/96SF
96	Construction Period Phase 2	90 wks	26 Sep '16	15 Jan '18/97FS+92 wks
97	Client Commissioning phase 2	18 wks	18 Jun '18	19 Oct '18/96
98	Physical Move phase 2	30 days	22 Oct '18	30 Nov '18/97
99	Occupation phase 2	1 day	03 Dec '18	03 Dec '18/98
194	Cultural Centre	1381 days	07 Oct '13	21 Jan '19
195	Brief Preparation	12 wks	07 Oct '13	27 Dec '13
196	Design Competition	26 wks	30 Dec '13	27 Jun '14/195
197	Design	52 wks	30 Jun '14	26 Jun '15/196
198	Tender	18 wks	29 Jun '15	30 Oct '15/197
199	Construction	156 wks	02 Nov '15	26 Oct '18/198
200	Client commissioning	12 wks	29 Oct '18	18 Jan '19/199
201	Occupation	1 day	21 Jan '19	21 Jan '19/200
242	Innovation Centre	980 days	12 May '16	11 Feb '19
243	Brief	20 wks	12 May '16	28 Sep '16/243
244	Design Competition	30 wks	29 Sep '16	25 Apr '17/244
245	Design	12 mos	26 Apr '17	27 Mar '17/245
246	Tender and Evaluation	20 wks	28 Mar '17	14 Aug '17/246
247	Construction	18 mos	15 Aug '17	31 Dec '18/246
248	Commissioning and Occupation	6 wks	01 Jan '19	11 Feb '19/247
249	Southern Research Centre Number 3	980 days	12 May '16	11 Feb '19
250	Brief	20 wks	12 May '16	28 Sep '16/249SS
251	Design Competition	30 wks	29 Sep '16	25 Apr '17/250
252	Design	12 mos	26 Apr '17	27 Mar '17/251
253	Tender and Evaluation	20 wks	28 Mar '17	14 Aug '17/252
254	Construction	18 mos	15 Aug '17	31 Dec '18/253
255	Commissioning and Occupation	6 wks	01 Jan '19	11 Feb '19/254
282	Faculty of Economics and Management Phase 2	871 days	10 Nov '16	12 Mar '20
283	Design	40 wks	10 Nov '16	16 Aug '17/79SF+96 mor
284	Tender	18 wks	17 Aug '17	20 Dec '17/283
285	Construction Period Phase 2	90 wks	04 Jan '18	25 Sep '19/284FS+10 da
286	Client Commissioning phase 2	18 wks	26 Sep '19	29 Jan '20/285
287	Physical Move phase 2	30 days	30 Jan '20	11 Mar '20/286
288	Occupation phase 2	1 day	12 Mar '20	12 Mar '20/287



289	Common Teaching 5	871 days	10 Nov '16	12 Mar '20
290	Design	40 wks	10 Nov '16	16 Aug '17 28355
291	Tender	18 wks	17 Aug '17	20 Dec '17 290
292	Construction Period CTF5	90 wks	04 Jan '18	25 Sep '19 291FS + 10 days
293	Client Commissioning CTF5	18 wks	26 Sep '19	29 Jan '20 292
294	Physical Move CTF5	30 days	30 Jan '20	11 Mar '20 293
295	Occupation CTF5	1 day	12 Mar '20	12 Mar '20 294
262	Maths (or CS) Building	1101 days	26 Sep '16	14 Dec '20
263	Brief	20 wks	26 Sep '16	10 Feb '17 95
264	Design Competition	30 wks	13 Feb '17	08 Sep '17 263
265	Design	12 mons	11 Sep '17	10 Aug '18 264
266	Tender and Evaluation	20 wks	13 Aug '18	28 Dec '18 265
267	Construction	24 mons	01 Jan '19	02 Nov '20 266FS+1 day
268	Commissioning and Occupation	6 wks	03 Nov '20	14 Dec '20 267
231	Faculty of Fine Arts	1476 days	28 Apr '15	22 Dec '20
232	Draft Brief	12 wks	28 Apr '15	20 Jul '15
233	Approvals to proceed with draft brief	20 wks	21 Jul '15	07 Dec '15 232
234	Brief Development	20 wks	08 Dec '15	25 Apr '16 233
235	Competition Documents	12 wks	01 Mar '16	23 May '16 234FF+4 wks
236	Design Competition	24 wks	24 May '16	07 Nov '16 235
237	Design	50 wks	08 Nov '16	23 Oct '17 236
238	Tender	18 wks	24 Oct '17	26 Feb '18 237
239	Construction (30 mons)	135 wks	27 Feb '18	28 Sep '20 238
240	Client Commissioning	12 wks	29 Sep '20	21 Dec '20 239
241	Occupation	1 day	22 Dec '20	22 Dec '20 240
224	Housing Phase 2c	1036 days	23 May '17	11 May '21
225	Agree Brief	12 wks	23 May '17	15 Aug '17 224SF
226	Design	40 wks	15 Aug '17	22 May '18 225SF
227	Tender	15 wks	22 May '18	04 Sep '18 226SF
228	Construction	130 wks	04 Sep '18	01 Mar '21 227
229	Phase 2a Client Commissioning	10 wks	02 Mar '21	10 May '21 228
230	Phase 2a Occupation	1 day	11 May '21	11 May '21 229
269	Refurbish FST01	520 days	21 Jan '20	17 Jan '22
270	Brief	6 wks	21 Jan '20	03 Mar '20 270SF
271	Design	8 mons	03 Mar '20	13 Oct '20 271SF
272	Tender and Evaluation	12 wks	13 Oct '20	05 Jan '21 272SF
273	Construction	12 mons	05 Jan '21	06 Dec '21 273SF+15 days
274	Commissioning and Occupation	6 wks	07 Dec '21	17 Jan '22 273
275	Faculty of Engineering Phase 3	861 days	04 Dec '18	22 Mar '22
276	Design	40 wks	04 Dec '18	09 Sep '19 99
277	Tender	18 wks	10 Sep '19	13 Jan '20 276
278	Construction Period Phase 3	90 wks	14 Jan '20	04 Oct '21 277
279	Client Commissioning phase 3	18 wks	05 Oct '21	07 Feb '22 278
280	Physical Move phase 3	30 days	08 Feb '22	21 Mar '22 279
281	Occupation phase 3	1 day	22 Mar '22	22 Mar '22 280

