

**9/25/2016**

**To: EVCP Carol Christ**

**From: J. Keith Gilles, Dean, College of Natural Resources**

**Re: Impacts of possible re-purposing of Oxford Tract Research Facility**

A committee consisting of Peggy Lemaux, faculty director for the Oxford Tract (OT), Christina Wistrom, manager of the Oxford Facilities Unit, Kris Niyogi and Pat Zambryski, chairs of the Department of Plant and Microbial Biology (PMB), and Rodrigo Almeida, representing the Department of Environmental Science Policy and Management (ESPM) and chaired by Steven Lindow (College of Natural Resources, Executive Associate Dean) met on August 18, 2016 to discuss the issues involved with the possible relocation of the facilities and other activities at the Oxford tract. For purposes of this evaluation we considered all facilities excluding Warren Hall.

### **The Oxford Tract footprint**

The footprint of the Oxford Tract Research Facility includes a total of 5 building. Three glass-enclosed structures for plant propagation totaling 37,500 ft.<sup>2</sup> of plant growing space and approximately 2,611 ft.<sup>2</sup> of shared head house space are used for research and planting operations. Associated with these 3 glass-enclosed buildings are approximately 10,663 ft.<sup>2</sup> used for storage and support activities for operations, as well as 10 laboratory rooms, totaling approximately 5,520 ft.<sup>2</sup> that support the research of 9 different faculty members in the College of Natural Resources. In addition, these buildings also harbor a variety of necessary support equipment, such as autoclaves, pot washing facilities, seed storage rooms, cold boxes, and 7 plant growth chambers that provide tightly controlled plant growth conditions. In addition to the glasshouses, 2 secure structures for plant and insect experiments under outdoor conditions (lath houses) totaling 8650 ft.<sup>2</sup> are also part of the facility. Also present is an insectary building, totaling 2970 ft.<sup>2</sup> which provides temperature and photoperiod controlled rooms for insect colonies. The Natural Resources Laboratory (NRL), totaling 6600 ft.<sup>2</sup>, contains more temperature controlled insect-rearing space and a USDA APHIS-certified biosafety level-2 (BSL-2) quarantine facility. Research labs of 3 faculty members, totaling 2150 ft.<sup>2</sup>, are also located within the NRL. In addition to the land housing these structures, there are growing fields totaling 66,860 ft.<sup>2</sup>. There are a large number of users of all of these various facilities. A total of 19 different faculty from the Department of Environmental Science Policy and Management, 21 faculty from the Department of Plant and Microbial Biology, and 4 faculty from other UC Berkeley departments make use of these facilities. These facilities also support instruction, being an important component of 3 ESPM classes and 2 PMB classes, as well as the programs of two different undergraduate student groups (details in appendix 1).

The committee was vehemently of the opinion that the facilities and functions currently located at the Oxford Tract must continue to be provided by UC Berkeley. All further discussion was therefore based on the assumption that greenhouse/field/insectary functions would have to remain even in the event that the Oxford Tract itself would be repurposed. The ability to

propagate plants and insects and to incubate them under environmentally controlled conditions is central to the many research programs present in both PMB and ESPM, as well as other departments across campus. This infrastructure is critical for research in fundamental aspects of plant biology, insect biology, plant microbe interactions, environmental science, plant ecology, bioenergy, plant genetics and numerous other fields of study. This work brings in many millions of dollars of research funding that is dependent on the existence of these facilities. The usage of the facilities is expected to continue to grow in the future because of increasing usage from participants in large programs at the Joint Bioenergy Institute (JBEI) and the Innovative Genomics Initiative (IGI). It was therefore deemed essential that these facilities remain available to our faculty.

### **Importance of proximity of facilities to central campus**

Most of the users of the facilities at the Oxford Tract make frequent, in person visits to the facility from laboratories and offices located on the central campus, or bring plants and insects to their labs on campus for further study. As such, the greenhouses and insectaries located at the Oxford Tract are, in most cases, a direct extension of that work of their research. For example, various treatments are applied to plants or insects, genetic crosses are made between plants, and frequent measurement of plant responses to genetic or experimental manipulations are required. Because of this, there is a substantial flow of personnel between the Oxford Tract and the central campus on a daily basis - approximately 28 person trips per day even in the summer, with much higher foot traffic at other times of the year. These trips often involve the movement of considerable volumes of experimental materials, and thus reflect not only the visitation by researchers alone. In the case of researchers studying phytophagous insects and inter-specific interactions (the dominant insect-related research on campus) there is a constant flow of plant material to and from the Oxford Tract into the various laboratories and controlled environmental rooms in which insect studies are conducted. Because much of the material is either transgenic or held under quarantine its movement is highly regulated and is permitted only using restricted conditions. It should therefore be emphasized that the plant growth facilities and insectaries are extensions of the campus-based research laboratories themselves, and any action that would hinder this linkage would be a direct and serious hindrance to the research programs involved.

Disruption of support facilities at the Oxford tract to on-campus research laboratories was deemed unacceptable to the many research programs involved. Not only would the transfer of plants and other materials from a remote location take an excessively long time, in many cases it would make certain types of research impossible. Because of this, there was unanimous agreement that transfer of these facilities away from the central campus would serve as a serious impediment to recruitment of both faculty and graduate students who would need these facilities to be readily available. Furthermore, there was also the expectation that certain faculty members who had been attracted to Berkeley because of the proximity and availability of these needed research facilities would move their programs to another institution where the research needs could be better met. This would also impede the efforts of existing faculty to get grants to work on crop plants, which require the use of these facilities and frequent monitoring of the experimentation. For these reasons, there was grave concern that replacement of these facilities solely at a remote site, even with high-quality installations reflecting state-of-the-art features

expected in a new facility, would not prove to be an acceptable alternative to the existing ones at the Oxford Tract for most campus researchers.

### **Remediation needs in the event of a repurposing of the Oxford tract**

Given the importance and specialization of the research functions now performed at the Oxford Tract to UC Berkeley researchers it is clear that all of those functions currently conducted there would need to be reproduced at other sites upon its repurposing. Since research anticipated as part of the UC Berkeley IGI and JBEI will involve both plants and insects, the need for support facilities for these activities is anticipated to grow even beyond the current facilities located at the Oxford Tract. The research laboratories currently located at the Oxford tract, totaling 5,520 ft<sup>2</sup> could not be moved to an off-site location without seriously impacting the research program of the many faculty involved, so space would need to be found on the central campus for these researchers. Such a process would likely require the reassignment of space from a variety of campus departments in order that laboratories appropriate for the programs to be displaced from the Oxford tract could be housed on campus. Because of the specialized nature of certain research laboratories currently located at the Oxford tract, at least some of the new labs would need to be renovated and altered. The committee based its further discussions on the assessment that the Gill Tract located in Albany was the only UC property within a reasonable distance of the Berkeley campus with, and of a sufficient size to accommodate some of the other functions currently housed at Oxford Tract (e.g., greenhouses, research field space, and storage). It should be noted, however, that while Gill Tract has significant open space for field research as well as to site new building, the limited infrastructure there is so limited, old and decrepit that a complete rebuild of facilities would be needed.

The committee thus considered 2 options for the reconfiguration of the reproduced facilities. In Option 1, a subset of essential research functions would be reproduced on central campus with the remaining facilities located at Gill Tract. Option 2, considered unacceptable because of its major negative impacts on research programs, would relocate all of the existing facilities and functions to the off-campus location.

#### **Option 1:**

Because of the essentiality of close proximity of insect rearing facilities, and at least a subset of the greenhouses, to the research labs located on the central campus, those most needed facilities would have to be accommodated somewhere on the central campus. While further research would be needed to determine the minimal facilities needed for research functionality, a preliminary estimate of at least 4,000 ft.<sup>2</sup> of research laboratories/insect rearing rooms, and 8,000 ft<sup>2</sup> of glass house space, would need to be located on the central campus. This limited glasshouse space could be made available only to those users having the highest need for such close proximity facilities. The remainder of the glasshouse space (30,000 ft<sup>2</sup>) would need to be reproduced at the remote site. The insect laboratories/rearing facilities could either be generated on campus by repurposing existing buildings, or by construction associated with either new buildings built on the re-purposed Oxford Tract or perhaps associated with other new campus buildings planned such as a Tolman Hall replacement building. There is a concern, however, that research greenhouse operations would not be compatible with buildings for undergraduate residential use. Insect rearing facilities would require relatively few specialized features and thus

could relatively readily be reproduced in existing buildings. One of the requirements of these replacement insect facilities would be that they would be in somewhat close proximity to the replacement glasshouses on campus. In contrast, replacement glasshouses need full exposure to sunlight and thus logically could be placed only on the top of existing or replacement buildings. While they also could be placed on the roof of buildings constructed at the Oxford tract, such a process could seriously impact research programs unless replacement glasshouses were constructed before existing glasshouses were demolished. For that reason, construction of glasshouses on the top of other planned campus buildings might be a preferable option. Current construction costs for research glasshouses located at ground level are approximately \$500 per square foot. It could be anticipated that construction costs for glasshouses on top of a building would be considerably higher. Thus the cost of producing on-campus glasshouses would be \$4 million at a minimum. The remaining 30,000 ft.<sup>2</sup> of glasshouses would need to be reconstructed at the remote location at a cost of approximately \$15 million. In addition to replacing the subset of glasshouse space on the central campus there also is a need to replace the existing growth chamber facilities located in the Oxford facility as well as to purchase additional growth chambers to accommodate those plant growth activities that cannot be tolerated at a distant site. The footprint of such growth chambers is not as large as the insect rearing and glasshouse facilities noted above, and could be accommodated either in existing buildings such as Koshland Hall or the EBI building, or in newly planned campus structures. Support facilities for both the on-campus and off-campus glasshouses and on-campus growth chambers could be located at the remote site. A building supplying 11,000 square feet of usable space for storage of supplies, soil preparation, autoclaving, etc. would need to be constructed at the remote site.

Repurposing of the Oxford tract would eliminate nearly 67,000 ft.<sup>2</sup> of research field space. Such space would have to be accommodated at the Gill tract. Construction of replacement facilities would therefore need to be placed to the west of current development area (South of Village Creek) in an area still occupied by the College of Natural Resources. The increased number of researchers whose field research needs would now need to be accommodated in the limited Gill tract field area would undoubtedly create a situation in which all needs/requests could not be met. Further research will be needed to know whether additional land could be found to accommodate certain projects that could not be accommodated at this site. Current uses of the Oxford Tract field area include not only researcher plantings but also an outdoor classroom used in teaching, the student organic gardens also used in teaching, and the Urban Bee Garden, a bee behavioral study area, all of which necessitate frequent visitation by students and the public. Oxford Tract is also currently the only UC Berkeley field site at which recombinant plants can be propagated under federal permit. The permit requires that the field site limit access of the public. As such, the Oxford tract currently has a relatively robust security system. Such a security system would need to be established at the Gill Tract to enable transgenic plants to be grown there. This would require a more “permanent” boundary between the land currently allocated to research and under the control of field operations and that allocated to outreach and public engagement in urban agriculture at the Gill Tract Community Farm. The field site at the Oxford Tract is currently located adjacent to buildings with restrooms, and such restroom facilities would need to be built at the Gill Tract.

While Option 1 would accommodate a few of the most frequent users of glasshouse facilities by locating them on campus, a large number of other users of both glasshouses as well as the field

facilities, would no longer have ready access. Because these individuals have the central campus as their workspace, many would not have personal transportation to the remote site. Furthermore, as noted above, these individuals will also frequently need to transport plant materials and other supplies to and from the remote site, particularly problematic for transgenic materials where additional federally-mandated precautions are necessary. Because of the restrictions on the way in which plant material must be transported, and the practical limitations of moving such voluminous and fragile material, specialized transportation would need to be provided on a regular basis (at least hourly, if not on-demand) to and from the remote site to enable personnel to conduct their research or to participate in student led research projects. Such transport could not be on mixed-use vehicles such as resident shuttles because of the specialized requirements for safe transport of the materials and plants.

## **Option 2**

Option 2 would differ from Option 1 discussed above only in that all of the glasshouse facilities currently located at the Oxford Tract would be reproduced at the remote site. Likewise, if it were necessary to reproduce all of the glasshouses at the remote site, it might also be necessary to establish certain of the insect-rearing facilities at the remote site so that there would be ready access to the plant material produced in the glasshouses. All of the other glasshouse support facilities, and improvements in field security needed to relocate field experimentation previously occurring on the Oxford Tract as discussed above, would be required.

Oxford and Gill Tract Buildings and Field Space (estimated) – 8/18/16 – Tina Wistrom

<u>Building</u>	<u>Square feet</u>	<u>No. Rooms</u>
GPB (North) - greenhouse	10,000	10
GPB (North) - building	4,500	12
Oxford RES (South) - greenhouse	23,100	29
Oxford RES (South) - building	27,400	80
Insectary Greenhouse	4,400	12
Insectary Building	2,970	12
Natural Resources Laboratory	6,600	22
Lath houses	8,650	5
<b>Total</b>	<b>87,620</b>	<b>182</b>
Oxford research field	58,860	.
Oxford outdoor classroom	8,000	.
<u>Gill Tract</u>		
Support space (indoor)	5,150	5
Research field	196,000	.
UCGT Community Farm	54,450	.

GPB (North) Greenhouse (1990): 10 greenhouse rooms with +/- 3°C temperature control, HID lighting, di/fertilizer/tap/compressed air; 1000 sf photoperiod control. Twelve service rooms (pesticide storage/mixing, 3 wet labs, head house, office, 4C cold box, storage, autoclave, restrooms with showers, mechanical, loading dock).

Oxford RES (South) Greenhouse (1960-64): 29 greenhouse rooms with tap/fertilizer/di. 13 with HID lights; 80 service rooms including 10 labs, 18 offices, four head houses, five autoclaves, pot washing and greenhouse supply storage, emergency supply storage, drying room, seed storage room, mechanical, four restrooms. Five growth chambers (+two walk-ins under construction) not included in room total.

Insectary Greenhouse (2002): Twelve rooms with +/- 3°C temperature control, HID lighting, di/fertilizer/tap water.

Insectary Building (2002) includes a head house, 8 temperature controlled rooms, an incubator room, two cold boxes, restroom, autoclave, mechanical room.

Natural Resources Lab (1980) consists of four wet labs, an APHIS-certified BSL-2 insect quarantine facility (sun room, lab, and controlled temperature room), two autoclaves, two incubator rooms, four offices, library, lunch room and two restrooms.

Gill Tract Buildings consist of a tractor shop, storage and meeting space (UCGTCTF), lunch room, and restroom.

## Appendix A: Oxford Facilities Unit Users FY 2015-2016

### **Environmental Science, Policy, and Management**

Almeida, Rodrigo	Altieri, Miguel
Carlson, Stephanie	Daane, Kent
Firestone, Mary	Frankie, Gordon
Garbelotto, Matteo	Getz, Christy
Kremen, Claire	Merenlender, Adina
Mills, Nick	Pallud, Celine
Sowerwine, Jennifer	Sposito, Garrison
Stephens, Scott	Suding, Katherine
Tsutsui, Neil	Van Steenwyk, Robert
Wood, Dave	

### **Plant and Microbial Biology**

Blackman, Ben	Bruns, Tom
Coleman-Derr, Devin (PGEC)	Feldman, Lew
Fischer, Bob	Hake, Sarah (PGEC)
Harmon, Frank (PGEC)	Lemaux, Peggy
Lindow, Steve	Luan, Sheng
Melis, Tasios	Niyogi, Kris
Somerville, Chris	Somerville, Shauna
Specht, Chelsea	Staskawicz, Brian
Sung, Renee	Terry, Norman
Wildermuth, Mary	Zambryski, Pat
Zilberman, Daniel	

### **Non-CNR**

Chakaborty, Romy – LBNL  
Hammond, Ming – Chemistry  
Lindberg, David - Integrative Bio.  
Rhew, Robert – Geography

### **CNR-Classes**

ESPM 117 – Miguel Altieri  
ESPM 118 – Miguel Altieri  
ESPM 155 – Kathy DeMaster  
PMB 24 – Renee Sung  
PMB 107 – Chelsea Specht

### **Undergraduate Student Groups**

ESW (Engineers for a Sustainable World), 2 projects  
SOGA (Student Organic Gardening Association)

### **Non-UC Berkeley**

Davidson, Eric - Asilomar Bio, Inc.  
Hempel, Fred - Artisan Seeds  
Tamsir, Alvin - Pivot Bio