Preliminary Peer Review Report for
The City of Palo Alto
November 6, 2007

Executive Summary

Evaluation of Proposed Stanford Medical Center Hospital Projects

The City of Palo Alto has commissioned a Peer Review of Stanford’s two major proposed facility development projects:

- The renewal and replacement of the adult Stanford Hospital and Clinics (SHC) and
- The renovation of and addition to the Lucile Packard Children’s Hospital (LPCH).

The Peer Review investigations are aimed at validating the need for the two projects and determining the extent to which the proposals fall within the norms of current-day hospital planning and construction, identifying areas of convergence with or divergence from these norms.

The key issues addressed in the Peer Review investigations, and the conclusions reached, are summarized below. The full report presents and explains in detail the factors, benchmark data and observations that support the conclusions.

A. Bed Numbers – the fundamental “driver” of space needs

Stanford’s proposed projects are for inpatient hospital expansions and improvements. The number of inpatient beds is the most basic space driver. The bedrooms themselves require space and the size of all the support services, from operating rooms to staff areas to food service and housekeeping, are based on the numbers and types of patients being accommodated.

SHC is proposed to increase from 456 to 600 beds (32%) and LPCH from 257 to 361 beds (40%). The combined bed numbers will increase from a current total of 713 to a new total of 961, an overall increase of 35%.

1. Source of bed numbers

   Stanford has done significant research and analyses on several levels to define the number of beds proposed for each hospital. Individual medical departments, the overall Medical Center, and Stanford’s Strategic Business development department all analyzed bed need. Two independent outside specialist consultants reviewed internal assumptions and data and developed bed number projections, and two separate planning firms reviewed and confirmed the numbers, resulting in a consensus on the bed number projections noted above.

2. Factors that influence bed number projections:

   a. Demographics – both an aging and a growing population.
   b. Disease types and medical conditions – increases in acuity, multi-system problems
   c. Current occupancy rates – nearing 90% – no additional capacity
      i. SHC and LPCH are turning patents away due to lack of beds to put them in.
   d. ALOS (average length of stay) is no longer decreasing, as it was for many years.
   e. Closure of other local hospitals creates regional pressure for more inpatient beds
   f. Increased focus on disaster preparedness and emergency response
3. Conclusion:
It appears that the bed numbers proposed for the new hospitals are supportable and that thorough analyses have taken place at several levels. The increase of approximately 35% for hospitals that were planned 25 years ago (SHC) and 20 years ago (LPCH) seems congruent with what might be expected, given the time lapse, the changes in demographics, the closure of other local hospitals, the advances in medical treatments and capabilities, the renowned expertise of SHC and LPCH, and the need to look to the future.

B. Private Patient Bed Rooms
A major factor in the size of the hospital projects is the fact that nearly all replacement and renovated patient bedrooms will be private, single rooms, each with its own toilet room.

1. Bed Number Comparison
The two hospital projects propose a major increase in the proportion of patient beds in single, private rooms. Overall, the two hospitals will go from 35% single rooms to 89% single rooms. The shift from double rooms to singles creates a major space increase, even without the addition of more beds.

2. Industry Standard is Single Patient Bedrooms
Almost all new hospitals across the nation are being planned for single patient, private bedrooms, with individual toilet/shower rooms. This research found no hospital or consultant who was planning for other than private rooms or had done so in recent years. Reasons include a reduction of hospital-acquired infections and reduced likelihood of medication errors as well as a greatly reduced need for patient transfers due to inability to match compatible roommates (disease, age, gender). Single patient rooms increase bed utilization and operational efficiency and reduce patient falls and nurse injuries due to transfers. Finally, single patient rooms greatly improve patient satisfaction and are a clear nation-wide preference.

3. Guidelines and References
American Institute of Architect (AIA) guidelines, upon which most state codes are based, now mandate single patient bedrooms except in special cases for all new construction. CA is in the process of adopting these guidelines and anticipates doing so in 2008. Review of other hospital planning sources, from national documents such as the 2007 “Hospital of the Future, Lessons for Inpatient Facility Planning and Strategy,” to discussions with national planning and design firms, to many institutional healthcare providers, confirms that all recommend planning for single, private patient bedrooms. Numerous CA hospitals planned or recently constructed have used all single patient rooms. (UCLA, UCSF, Kaiser and more.)

4. Conclusion
Given the pervasive attitude and evidence-based research favoring private patient rooms, it would be unreasonable to expect Stanford to plan for anything other than private patient rooms.

C. Size of Patient Bedrooms
Single rooms require more space per patient than semi-private rooms, plus each single room requires its own toilet/shower room. Patient bedrooms are the single most repetitive element in a hospital. Inpatient nursing units account for approximately 50% of the total hospital area for both SHC and LPCH. A shift from double to single rooms has a major space impact.
1. **Private Room Area Comparisons**
   A comparative review of the size of recently planned and designed private patient bedrooms, including toilet rooms, was conducted. Data was obtained from several sources, including the national Health Care Advisory Board, Kaiser, UCLA, UCSF, and a number of national planning and design firms representing numerous hospital projects.

2. **Observations and Conclusions:**
   The size of patient bedrooms for both SHC and LPCH is programmed within the range of other peer institutions and is reasonable for any current-day hospital development. Academic hospitals typically require larger spaces than community hospitals, yet Stanford's numbers compare reasonably with those of Kaiser as well as those of other academic teaching hospitals such as UCLA and UCSF.

D. **Operating Rooms (ORs), Emergency Department (ED) and Imaging Services**
   Each of these service areas represent a key space user and service component of the hospitals. Each is planned to expand significantly, primarily due to a projected increase in patient volume and acuity and a dramatic increase in medical equipment and technologies in use today. In each case, there is a considerable space and capacity deficit already existing which must be made up, plus a very important need for expanded capacity to accommodate new growth.

   As with patient bedrooms, each area was reviewed relative to comparable institutions and other CA hospitals. To the extent that comparable data were available, each was found to be consistent with areas planned for other academic teaching hospitals of Stanford's size and level of care. (This applies to both SHC and LPCH.) Detailed reasons for the growth and needed space increases for each of these areas is included in the full Peer Review Report.

1. **Comments on ORs, Growth in Size of Operating Room Suites - “Interventional Platforms”**
   The size of operating rooms and associated support space has dramatically increased industry-wide, and nation-wide, over the last decade. The OR is no longer a single room, but rather the hub of a complex array of interventional diagnostic and treatment services. Sophisticated medical equipment has proliferated, as has the number of staff and computer support equipment needed. The sizes of the ORs planned for SHC and LPCH are consistent with comparable rooms in other institutions.

   There are no reliable rules of thumb for the number of ORs relative to patient beds. SHC and LPCH are both quaternary care academic teaching hospitals, with the highest level of acuity patients anywhere. Surgeries performed in these hospitals are often more complex and take longer than in community hospitals such as Kaiser. Stanford has done in-depth analyses of anticipated patient volumes, types of cases, and utilization patterns, to determine the numbers of ORs it is proposing.

2. **Comments on Emergency Department (ED) Issues**
   The Emergency Department at Stanford Medical Center is shared by LPCH and SHC, and is a Level I Regional Trauma Center, designated to provide the highest level of care for serious emergencies, traumas and extreme/mass disasters. Stanford's Level I Trauma designation covers a multi-county region, including the counties of Santa Clara, San Mateo (southern portion), Monterey, Santa Cruz and San Benito.
Stanford is proposing a 33% increase in the number of ED treatment rooms – comparable to the increase in patient beds, as well as an increase in support space. This is driven by the rising acuity of patients admitted, the current over-crowding (long waits and patients being diverted to other hospitals), the proliferation of sophisticated medical equipment, privacy demands of government regulations (HIPPA), and the need for disaster surge capacity. Sizes of proposed ED treatment spaces compare reasonably to those of other comparable institutions as well as to Kaiser. All treatment room spaces are being proposed as private exam rooms, not curtained multi-patient treatment bays, as is the current industry standard.

3. Comments on Imaging Department Growth and Change
   Of all the departments in a hospital, the Imaging Dept. (Radiology) has experienced the most extreme growth and change in equipment, technologies, new approaches and methodologies over the last decade. New medical devices, new treatment modalities and new diagnostic techniques and tools, have all contributed to a massive explosion in equipment, the need for space to accommodate it, and the growing technical staff to provide the services. Further, constant new developments dictate a need for space to allow for expansion and change, and infrastructure to support it.

4. Observations and Conclusions relative to ORs, the ED and Imaging:
   In addition to the increase in anticipated patient volumes and inpatient beds, the explosion of technologies and applications of medical equipment and treatment capabilities are creating a whole new set of space and infrastructure needs for hospitals nation-wide that didn't exist when SHC and LPCH were planned. The uncertainty of new advances dictates that new hospital construction, especially in an academic teaching center like Stanford, should be prepared to accommodate at yet undefined new developments. On a room-by-room basis, specific rooms for each of the key areas, ORs, ED and Imaging, appear to be within typical norms for new hospital developments. This information is presented in more detail in the full Peer Review Report.

E. Overall Hospital Space Growth and Hospital Size: Additional Factors to Consider
   In addition to the increase in space needs for specific rooms and services within hospitals today, there has been a general growth in support functions, corridors, and overall area. Some causes for this are need for infection control (separation of functions, more corridors), regulatory demands, ADA barrier-free requirements, more equipment storage, more complex infrastructure demands, and the need for competitive patient and staff amenities. Academic teaching hospitals – at the forefront of all medical advances – are incorporating ever more medical equipment and research approaches (clinical trials, etc.) which demand more staff and specialized space.

   One measure of the growth in overall hospital space is the “net to gross” multiplier, a planning metric used to convert programmed “net” space into actual building size. These multipliers have been growing over the past 10-15 years. Whereas the gross area of a hospital used to be 60% to 70% greater than the net area, it is now well over 100% greater. Stanford’s space programs, for both SHC and LPCH, accurately reflect this change in the magnitude of space multipliers, comparable to other recently planned hospitals.

F. Building Height Comparisons – Floor-to-Floor Heights
   Several factors lead to the need for greater “floor to floor” heights in each floor of a hospital. (This is the distance between the structural floor plates, not the visible ceilings.) These include CA seismic and structural codes, more complex infrastructure, ceiling booms for medical
equipment and patient movement slings, and need for access for maintenance and change. Overall, floor-to-floor heights have increased by about 2’ over the past 15 years.

1. **Floor-to-Floor Height Comparisons of Hospitals**
The floor-to-floor heights proposed for Stanford’s hospital developments were compared to those of other recent CA and national hospital projects. The Stanford proposed heights are within the current norms. Nursing units are proposed to be 16’ high and Diagnostic and Treatment areas (Surgery, Imaging) to be 18’ – 20’ high.

2. **Observations and Conclusions**
Design heights for floor-to-floor vertical space are reasonable and comparable to those used by other planners and institutions. Thus, even a 3-story above-grade building may well exceed 50’, the current height limit of the Palo Alto City zoning code.

G. **Hospital Configuration – vertical vs. horizontal balance – relative to overall building height**

Total building height depends on the way buildings are configured – how much is stacked up vertically and how much is spread out horizontally. Overall building height will result from how the buildings are configured, how many stories high they are – not the height of each story.

1. **Major site area limitations**
   Current design proposals for SHC and LPCH are over 3 stories and over 50’ in height. SHC is proposed as 7 stories tall (120’ - 130’) and the LPCH addition as 4 stories (about 70’). The preliminary design concepts are based on contemporary principles of good hospital planning, on the necessity (particularly for LPCH) of coordinating functionally with existing service locations, and on the critical importance for both institutions of keeping all existing medical services in operation during the phased construction of new space. The design configurations are also dictated by the limited site area available.

   Even a 3-story above grade hospital structure (which the SHC HMP is now) can barely fit within the 50’ zoning height limit of the City of Palo Alto. Thus, regardless of good planning goals – if the two hospitals were to construct the approximate magnitude of space currently proposed in the space programs, and to maintain a design configuration profile of no more than 3 stories, they would occupy considerably more than double the amount of horizontal site area the proposed plans currently show.

   The existing Stanford Medical Center campus does not have enough area available to accommodate a horizontal development of approximately 50’ in height at the magnitude of space required, plus required access, parking and service, and some green open space – regardless of good functional design.

2. **Different Plan Configurations for SHC and LPCH**
The proposed plans for SHC and for LPCH differ from each other considerably. SHC is basically a replacement hospital proposed to be 7-stories above grade, with 5 floors of nursing units stacked on top of a 2-story base of diagnostic and treatment floors. LPCH would be a 4-story tall above-grade addition, with 4 floors of new nursing units horizontally adjacent to the existing building, connected by corridors and support spaces.
In both cases, the plan configurations and overall building heights result from and are in response to existing circumstances and limitations, including limited site area available in the right locations, necessity for construction to be phased so that patient care and operations can be maintained throughout the development process, and the necessity to relate to existing structures and site conditions.

3. **Factors to consider relative to the “stacked” configuration of the SHC replacement hospital**
   Three options for the SHC were explored, but in all cases, the “base footprint” – the amount of horizontal site area used by the building – was essentially the same: about 170,000 BGSF. This is as big a footprint as can be fitted on the site, while still allowing space for a new parking structure, ambulance access, and necessary circulation – as well as space to stage and implement the construction project. In each option, different nursing unit configurations were created, but all needed to be stacked on top of the same “interventional platform” base to fit on the site. The number of stories did not vary. This “stacked” configuration is common for most large hospitals of over 250-300 beds. There are a number of operational and patient care advantages, as well as efficiency of land use.

4. **Factors to consider relative to the Horizontal Configuration of the LPCH addition**
   The proposed LPCH project is a side-by-side addition to the existing hospital, with some renovation of existing space and considerable relocation of patient beds from existing space to new construction. There is no other way to add patient beds to this structure. Even if desired, additional stories can not be added on top of the existing building due to CA seismic code restrictions.

5. **Future Expansion and Change Concerns**
   For both LPCH and SHC, the existing Stanford site appears nearly “maxed out.” This creates a strong need to maximize the use of the site in the most space-conservative way. The LPCH plan outlines space for one additional future nursing unit to be built, supported by and connected to the other services in the hospital. It is not clear how or if the new SHC could expand in the future – although there will be a little latitude after the new replacement hospital is completed and the oldest portion of the existing hospital is demolished.

6. **Comparative hospital configurations**
   The configuration of a number of recent comparable hospital developments was reviewed, including UCSF at Mission Bay, UCLA, El Camino, Mass. General, Johns Hopkins, and others. Every single one of those hospitals is planned or constructed with a “stacked” configuration of nursing units on top of 1, 2 or 3 stories of a diagnostic and treatment base.

   Examples of approximate heights of these recent developments range from about 90' for El Camino Hospital (5 stories) to about 110' for UCSF at Mission Bay (6 stories), about 120' for Hoag Memorial (6-7 stories) about 140' for UCLA (8 stories), and about 200' or higher for Mass. General and Johns Hopkins, at 10 and 12 stories respectively.

7. **Observations and Conclusions**
   Given the site area restrictions as well as the need to maintain ongoing operations during construction, the hospital design configurations proposed by Stanford make sense. It is difficult to imagine other realistic concepts for providing the needed space and maintaining a significantly lower height profile for either of the buildings. There may be other variations...
of these concepts, but it is highly unlikely that they would result in significantly lower profiles or alter the overall impact of the buildings on the site.

H. Services located off-site
Stanford has already off-loaded all of the “non-essential” services allowed by CA code to be off site. These include accounting and business services, human resources and many administrative functions. This adds up to about 200,000 GSF of space that is off campus and is not intended to be brought back. None of these services is included in the current proposed space programs.

I. Staffing
This report does not address staffing of the proposed hospitals. The EIR application states the staffing/personnel projections which Stanford has developed. These numbers relate to both the numbers of inpatient beds and also to all of the other outpatient and support services that comprise the hospital functions. The primary increase in staffing is due to the increased numbers of patient beds.

J. Summary
1. Space as Proposed by Stanford
The Peer Review overall assessment is that Stanford’s space programs and plans are not in any significant way outside standard norms for good planning and current-day medical practice, especially for a premier academic teaching hospital that is being designed to serve at least 25-30 years into the future. The significant increase in size proposed for both hospitals is, unfortunately, typical of recent hospital improvements and development projects in CA and across the nation.

While perhaps 5 - 10% of space might be reduced without changing functions, this will not have a significant impact on the order of magnitude of the two projects. (This is about the maximum amount of “tightening” that can possibly occur during design, and even that is very difficult.) In the normal project development process, Stanford will be trying to “tighten” its spaces anyway in an effort to conserve site and minimize costs. They are already doing this with the LPCH space program.

2. Impact of Proposed Increase in Numbers of Beds
If Stanford’s patient volume assumptions and bed number projections are reasonably accurate and acceptable – then the rest of the space follows in a rational fashion and compares reasonably well with similar spaces for peer institutions.

However, if the rationale for Stanford’s projected increase in new beds is not deemed supportable, then the space needs could be reduced substantially.

Stanford appears to have done solid “due diligence” in forecasting the number of additional patient care beds it needs for SHC and for LPCH. As far as this Peer Review investigation can tell, the additional patient bed need is valid.