

Technical Report

Part 1 of 5: The Application of Target Value Design in the Design and Construction of the UHS Temecula Valley Hospital

Doanh Do, Glenn Ballard, Patricia Tillmann

Project Production Systems Laboratory University of California, Berkeley

October 2015

Table of Contents

	duction	
	earch Objectives	
1.2 1110	Case Study Project	. 9
2 Liter	ature Review	10
2.1 Tar	get Value Design	10
2.2 Tar	get Value Design Benchmarks	11
2.3 Inte	grated Project Delivery (IPD)	
2.3.1	Sutter Health's 5 Big Ideas	14
3 Rese	arch methodology	15
	e Study Method	
	lytical framework	
	a Collection Techniques	
3.3.1	Interviews	
3.3.2	Document Analysis	
3.3.3	Surveys	
3.3.4	Target Value Design Research Group Meeting	
	arch Findings	
4.1 Pro	ject History	
4.1.1	Lean Training at Temecula Valley	
4.1.2	Project Timeline	
4.1.3	Forming the Project Team	
4.1.4	Contractual Structure	26
4.2 Pro	ject Definition	27
4.2.1	Business Case	
4.2.2	Stakeholder Values	27
4.2.3	Conditions of Satisfaction	
4.2.4	Target Setting	
4.2.5	Expected Cost During Design and Construction	34
4.3 Stee	ering to Targets During Design	35
4.3.1	Cross-functional Teams For Design	35
4.3.2	Integrated Governance	39
4.3.3	Joint Responsibility and Transparency	41
4.3.4	Co-location and Big Room Meetings	43
4.3.5	Collaborative Design Conversation	47
4.3.6	Simulation of Operations	
4.3.7	Building Information Modeling	
4.3.8	Last Planner® System of Production Control For Design	
4.3.9	Set-Based Design	55
4.3.10	A3 Reports	56
4.3.11	Value Engineering	58
4.3.12	Cost Modeling and Cost Tracking	58
4.3.13	Risk Identification and Risk Management	
4.3.14	Moving Money Between Boundaries	61
4.3.15	Challenges During Design	63
4.3.16	Innovations During Design	64
4.4 Stee	ering to Targets During Construction	65

4.4.1 Last Planner for Construction	
4.4.2 Location Based Planning	
4.4.3 Value Stream Mapping	
4.4.4 Process Mapping	
4.4.5 First Run Studies	
4.4.5 Thist Kull Staties	
4.4.7 Community of Practice (COP)	
4.4.8 Shared Key Performance Indicators (KPIs)	
4.4.8.1 Financial Position	
4.4.8.2 Billed to Date	
4.4.8.3 Budget and Path to Budget	
4.4.8.4 Current Risks	
4.4.8.5 Schedule and Milestones	
4.4.8.6 PPC and Schedule Variance	
4.4.8.7 Man Power Curves	
4.4.8.8 Weekly Production Rates	
4.4.8.9 Monthly Rework	
A A	
4.4.8.11 Lessons Learned / 5 Good Whys	
4.4.8.12 Project Photos	
4.4.8.13 Safety Metrics	
4.4.8.14 Inspection Metrics	
5 Project Performance Metrics	
5.1 Cost	
5.2 Schedule	
5.3 Quality	
,	
5.5 Productivity	
5.6 Profitability	
5.7 Cultural Outcomes	
5.8 Product Innovations	
5.9 Process Innovations	
6 Conclusion	106
6.1 Challenges	
6.2 Lessons Learned	
0	
6.4 Areas for Improvement	
6.5 Updating the P2SL Current Process Benchmark on Target Value Design	
6.6 Acknowledgments	
7 References	
8 Appendices	115
8.1 Monthly A3 Status Updates	
8.1.1 June 2012	
8.1.2 July 2012	
8.1.3 August 2012	
8.1.4 September 2012	
8.1.5 October 2012	

November 2012	123
December 2012	124
January 2013	126
February 2013	127
March 2013	129
April 2013	130
May 2013	132
June 2013	133
July 2013	134
August 2013	134
September 2013	135
October 2013	135
November 2013	136
December 2013	136
nple A3 Documents	138
Cardio Vascular Services at Temecula Valley	
Developing Paths of Travel to ICUs that are Acceptable to Licensing and OSHPD	138
Modular OR Ceilings	
, , , , , , , , , , , , , , , , , , , ,	
Select the Supply Chain Methodology for TVH	139
Selecting Location of Hand Wash Sink at Med/Surg Patient Room	
ter's 5 Big Ideas Survey	148
	December 2012 January 2013 February 2013 March 2013 April 2013 June 2013 June 2013 July 2013 August 2013 September 2013 October 2013 December 2014 December 2014 December 2

List of Figures

Figure 1: The Temecula Valley Hospital	10
Figure 2: The LCI triangle model (Thomsen et al., 2009)	13
Figure 3: Sutter's 5 Big Ideas (Macomber, 2004)	14
Figure 4: Major Milestone Schedule	23
Figure 5: Onboarding of Team Members	26
Figure 6: ConsensusDocs 300	27
Figure 7: Integrated Team	28
Figure 8: Cost Benchmarking	31
Figure 9: Components of Cost Model	32
Figure 10: Initial Target Cost (\$151 million)	33

Figure 11: Expected Cost Throughout the Project	34
Figure 12: Expected Profit (Tracked During Construction)	35
Figure 13: Cluster Groups	36
Figure 14: Flow of Requests and Communication	37
Figure 15: Role of Integrated Team and Clusters	37
Figure 16: Daily Check-ins and Meeting Schedules	38
Figure 17: Design, Estimate, Schedule, Construction Responsibilities within Clusters	39
Figure 18: Core Team and Community of Practices Roles	40
Figure 19: Cluster Leaders and Cluster Member's Responsibilities	41
Figure 20: Integrated Team	42
Figure 21: Field Board at Temecula (Seed, 2014)	43
Figure 22: Co-location Space (Temecula Valley)	43
Figure 23: Co-location Trailer Layout (Temecula Valley)	44
Figure 24: Big Room Meeting Scheduling Software	45
Figure 25: Big Room Meeting Agenda	46
Figure 26: Collaborative Design Conversation	47
Figure 27: Sets of Corridor Design Alternatives	48
Figure 28: The Role of Simulation in TVD	48
Figure 29: UHS Temecula ED Simulation	49
Figure 30: Executive Summary	49
Figure 31: Simulation Overview	50
Figure 32: Assumptions and Input Parameters	50
Figure 33: Simulation Model Results	50
Figure 34: Value Stream Mapping of Kitchen Operations	51
Figure 35: Temecula Valley BIM Model	51
Figure 36: Prefabricated Exterior Walls	52
Figure 37: Prefabricated Roof Truss	52
Figure 38: BIM for Piping Coordination and Quantity Take-offs	53
Figure 39: Framing Layout and Spool Sheets from BIM Model	54

Figure 40: Pull Planning Session	55
Figure 41: Set-Based Design	56
Figure 42: Temecula Valley A3 (Cardio Vascular Services)	56
Figure 43:Temecula Valley A3 (Location of Hospital)	57
Figure 44: December 2012 Report	57
Figure 46: Cost Tracking	60
Figure 47: Risk Identification and Risk Management	61
Figure 48: Expected Cost Throughout the Project	61
Figure 49: Cost Tracking	62
Figure 50: The Path Back	62
Figure 51: Budget and Billing Update	63
Figure 52: Changes in Scope Initiated by the Owner	63
Figure 53: Challenges That Increased Cost	64
Figure 54: Target Value Design Innovations	65
Figure 55: Weekly Planning Meeting	66
Figure 56: OurPlan	66
Figure 57: Percent Plan Completed	67
Figure 58:Flowline for Location-based Planning	68
Figure 59: Video Recording of Work	69
Figure 60: Value Stream Map of Door Installations	69
Figure 61: Waste vs. Value	69
Figure 62: Video Study of 2 nd Floor Exterior	70
Figure 63: Resulting Improvement from Video Study	70
Figure 64: Process Map for RFIs	71
Figure 65: Process Map for Submittals	71
Figure 66: First Run Studies	72
Figure 67: Production Rates and First Run Studies	73
Figure 68: Example of 5 Whys Analysis	73
Figure 69. Financial Position	75

Figure 70. Billed to Date	76
Figure 71. Path to Budget	77
Figure 72. Current Risks	77
Figure 73. Schedule Milestones	78
Figure 74. PPC Trends	79
Figure 75. Man Power Curves	79
Figure 76. Weekly Production Rates	80
Figure 77: Leveraging Productivity Data for Day to Day Decisions	80
Figure 78: Leveraging Productivity Data for Preplanned Decisions	81
Figure 79: Leveraging Productivity Data for the Work Week	81
Figure 80. Monthly Rework	82
Figure 81. Implemented Improvements	82
Figure 82. 5 Good Whys	83
Figure 83. Project Photos	83
Figure 84. Safety Log	83
Figure 85. Inspection Metrics	84
Figure 86: Cost per sf	85
Figure 87: Cost per patient bed	85
Figure 88: Safety Log	86
Figure 89: Labor Productivity	87
Figure 90: Garage Door	97
Figure 91: Using iPads to Document RFIs, Rework, and Change Orders	98
Figure 92: Masking Top Track Prior to SFRM	99
Figure 93: Screeding Z-Clips	99
Figure 94: All Materials on Carts	100
Figure 95: Backing Layout – Color Coded	100
Figure 96: Dry Erase Boards on All Floors	101
Figure 97: Spool Sheet Framing Layout	102
Figure 98: Labor Productivity Transparency in the Field	102

List of Tables

Table 1: Case study characteristics	. 10
Table 2: Analytical Framework Matrix	. 16
Table 3: Interviewees on the case studies	. 18
Table 4: Results from a Survey Conducted to Rate the Implementation of the TVD Benchmark	. 20
Table 5. Choosing By Advantages Example	. 24
Table 6: Percentage in Risk Pool	. 34
Table 7: Cultural Survey Summary	. 88

1 Introduction

1.1 Research Objectives

Target Value Design (TVD) is "a management practice that drives the design [and construction] to deliver customer values within project constraints" (Ballard, 2009). It is an application of Taiichi Ohno's practice of self-imposing necessity as a means for continuous improvement (Ballard, 2009). The TVD Research Group was originally a three-year research initiative launched in June 2010 by UC Berkeley's Project Production Systems Laboratory (P2SL) and DPR Construction Inc. to study the application of TVD on three hospital projects. The original goals of the group were to:

- 1) Improve TVD application within IPD projects.
- 2) Adapt TVD to other applications such as Design-Build and proposal development (Denerolle, 2011)

In 2013, the P2SL TVD Research Group expanded in both membership and in the scope of the research efforts. Several companies within the Northern California AEC industry joined the research group. The scope of the research investigation expanded to include the study of Universal Health Services' Temecula Valley Hospital Project (Table 1) and the Palo Alto Medical Foundation's Sunnyvale Medical Office Building (the subject of a separate report). Stephane Denerolle (2013) previously documented the application of TVD in the design phase of the three original case study projects: Sutter Health Eden Castro Valley, Sutter Health Alta Bates Medical Pavilion, and the UCSF Mission Bay Hospital. This technical report documents both the design and construction of the UHS Temecula Valley Project (Table 1). This study compares the practice of TVD on Temecula Valley to P2SL's process benchmarks.

The goal of this technical report is to present an in-depth case analysis of the TVD application on the UHS Temecula Valley Project. This report documents: (1) the project's history, (2) how TVD was applied during design, (3) how TVD was applied in construction, (4) the challenges of TVD, (5) the outcomes of the project, (5) the lessons learned, and (6) key innovations that resulted from TVD. For industry practitioners, this report may help them better understand TVD and be able to transfer some of these practices to their own projects. For researchers, this report can be a source of empirical data for theory building and replication.

1.2 The Case Study Project

The UHS Temecula Valley Hospital (Figure 1) is a \$151 million; five-story, 140-bed, 177,508-sq.-ft hospital located just north of San Diego in Southern California. The hospital includes 20 intensive care units (ICU), five high-tech surgical suites, a cardiac catheterization lab/interventional suite, and emergency room services (DPR, 2014). The new hospital project was commissioned and is operated by Universal Health Services (UHS), Inc. In the future, UHS plans to add an additional 150 beds, a medical office building, and a fitness center next to the current project site.



Figure 1: The Temecula Valley Hospital¹

Table 1: Case study characteristics

	UHS Temecula Valley
Total Project Cost	\$151 million
Estimated Maximum Price (EMP) ²	\$125 million
Square Footage	177,506
Number of Patient Beds	140 patient bed
Collaboration level	Multi-party Integrated Project Delivery
Contract Type	Consensus Docs 300

2 Literature Review

2.1 Target Value Design

Target Value Design (TVD) is an adaptation of Target Costing, a strategic profit planning practice used in new product development (Cooper and Slagmulder, 1997). "To ensure that products are sufficiently profitable when launched is to design them to a target cost determined by subtracting the product's desired profit from the expected selling price. Under this approach, cost is viewed as an input in the design stage rather than an outcome of it" (Cooper and Slagmulder, 1997). Target Costing has been used

(03/02/2014)

¹ Retrieved from the project blog at from: http://blog.hmcarchitects.com/Temecula-Valley-Hospital

² Total Project Cost includes owner costs and costs for work scopes within the risk pool (reimbursable), and for work scopes outside the risk pool (fixed price). EMP only includes costs for work within the risk pool.

in the Japanese industry since the 1960s under the name "Genka Kikaku" but it remained a trade secret until the 1980s (Feil et al., 2004). Target Costing and Kaizen Costing make up the total cost management program of Japanese automotive and manufacturing companies (Monden and Hamada, 1991). Within the Japanese construction industry, Target Costing is regarded as one of the most important management practices (Yook et al., 2005).

Target Costing was documented in the construction industry in the early 1990s by British Petroleum (BP) in the development of the Andrew Oil Field (Sakal, 2005; Knott, 1996). The relational contract and terms used for Target Costing by BP would later become known as Project Alliancing (Sakal, 2005), which is practiced in Europe and Australia. Nicolini et al. (2000) reported two case studies of Target Costing in the UK construction industry. Unfortunately, the application was unsuccessful because, according to the case study authors, the builders had become accustomed to buying and selling rather than designing and making.

Ballard and Reiser (2004) reported the first application of Target Costing in the United States construction industry on the St. Olaf Fieldhouse Project, which was completed in 2002 (Ballard and Reiser, 2004). The term "Target Value Design" was later coined by John Barberio to emphasize that the practice is not purely motivated by cost reduction but rather to ensure that the appropriate value is delivered to the customer (Macomber et al., 2007)—a feature of product development's target costing, but not evident in the name itself. During the 5-year research project with the P2SL TVD Research Group, the term "Target Value Delivery" has emerged to emphasize that TVD is applicable beyond the design phase. The goal of TVD is to deliver value to stakeholders within the physical, social, and financial constraints of the project.

Since its introduction, TVD has been widely accepted by the construction industry in the United States and appears in legal documents such as Sutter Health's Integrated Form of Agreement (IFOA) and the ConsensusDocs 300 (Lichtig, 2005; ConsensusDocs 2014). Several researchers have reported positive cost to market performance and cost certainty performance of TVD (Zimina et al., 2012; Do et al., 2014).

2.2 Target Value Design Benchmarks

The University of California, Berkeley's Project Production Systems Laboratory (P2SL) periodically publishes a TVD Process Benchmark. The first version of the TVD Process Benchmark was published in 2005, then revised and republished in 2009. (Ballard, 2011). The current TVD Benchmark provides the guidelines for applying TVD and includes:

1. With the help of key service providers, the customer develops and evaluates the project business case and decides whether to fund a feasibility study; in part based on the gap between the projects' allowable and market cost.

2. The business case is based on a forecast of facility life cycle costs and benefits³, preferably derived from an operations model; and includes specification of an allowable cost—what the customer is able and willing to pay to get life cycle benefits. Financing constraints are specified in the business case; limitations on the customer's ability to fund the investment required to obtain life cycle benefits.

3. The feasibility study involves all key members (designers, constructors, and customer stakeholders) of the team that will deliver the project if the study findings are positive.

³ This is the original language of the Benchmark, but on reflection, a better term is 'whole life costs and benefits'. "Life cycle" is commonly used to refer to the costs associated with operations and maintenance, whereas "whole life" includes the business use of the constructed asset. Example: Operations and maintenance of a hospital building versus the delivery of healthcare in the building.

4. Feasibility is assessed through aligning ends (what's wanted), means (conceptual design), and constraints (cost, time, location, etc.). The project proceeds to funding only if alignment is achieved, or is judged achievable during the course of the project.

5. The feasibility study produces a detailed budget and schedule aligned with scope and quality requirements.

6. The customer is an active and permanent member of the project delivery team.

7. All team members understand the business case and stakeholder values

8. Some form of relational contract is used to align the interests of project team members with project objectives.

9. A cardinal rule is agreed upon by project team members – cost and schedule targets cannot be exceeded, and only the customer can change target scope, quality, cost or schedule.

10. The cost, schedule and quality implications of design alternatives are discussed by team members (and external stakeholders when appropriate) prior to major investments of design time.

11. Cost estimating and budgeting is done continuously through collaboration between members of the project team—'over the shoulder estimating'.

12. The Last Planner[®] system is used to coordinate the actions of team members.

13. Targets are set as stretch goals to spur innovation.

14. Target scope and cost are allocated to cross-functional TVD teams, typically by facility system; e.g., structural, mechanical, electrical, exterior, interiors, etc.

15. TVD teams update their cost estimates and basis of estimate (scope) frequently. Example from a major hospital project during the period when TVD teams were heavily in design: estimate updates at most every three weeks.

16. The project cost estimate is updated frequently to reflect TVD team updates. This could be a plus/minus report with consolidated reports at greater intervals. Often project cost estimates are updated and reviewed in weekly meetings of TVD team coordinators and discipline leads, open to all project team members.

17. Co-location is strongly advised, at least when teams are newly formed. Co-location need not be permanent; team meetings can be held weekly or more frequently.

The TVD Process Benchmarks were derived from theory and from empirical studies of TVD projects. Researchers from the UC Berkeley's Project Production Systems Laboratory (P2SL) have been conducting action research on TVD since 2002 and the benchmarks reflect practices that have been observed to lead to favorable outcomes on TVD projects. This research compares the application of TVD on the UHS Temecula Valley Project to the TVD Process Benchmarks published by Ballard (2011). Based upon our findings from this case study (and from the 5-year research on TVD), the UC Berkeley's P2SL will publish an updated process benchmark to incorporate lessons learned and the "best practices" in TVD, as well as challenges and opportunities for further improving the benchmark.

2.3 Integrated Project Delivery (IPD)

"All projects contain three domains within which they operate: the project organization, the project operating system, and the commercial terms binding the project participants" (Thomsen et al., 2009; Figure 2). The project organization refers to how the project members are organized and includes the organizational structure, communication flows, decision-making process, project governance, etc. On a construction project, people can come at various stages and stay for varying amounts of time depending

upon their role and their scope of work. Integrated Project Delivery (IPD), a project organization practice, has been gaining popularity within the United States since the creation of the firm named Integrated Project Delivery in 1999, led by Owen Matthews of Westbrook Air Conditioning in Orlando, Florida (Matthews and Howell, 2005; AIA, 2007; Cohen, 2012). In addition to multi-party contracts, IPD is characterized by early involvement of the key participants including the contractors, designers, trade partners, and facilities managers, and by promoting collaboration through co-location, big room meetings, and shared governance. Raisbeck et al. (2010) stated that the notable differences between IPD and Project Alliancing (a project organization practiced in Australia and Europe) is that the use of Building Information Modeling (BIM), co-location, and big room meeting are mandatory on IPD projects. With Project Alliancing, these practices are not always required (Raisbeck et al., 2010).



Figure 2: The LCI triangle model (Thomsen et al., 2009)

The operating system includes methods and tools used to manage the project. The Lean operating system, which can be used with IPD, includes the Last Planner System⁴, A3 problem-solving/reports, Set-Based Design, Choosing by Advantages, Target Value Design, etc. In the case study, the project relied heavily on the Lean operating system as the contract language required the use of Lean management methods.

The commercial terms are the contract language that binds the participants together. IPD projects typically use a multi-party relational contract such as the Integrated Form of Agreement (IFOA) or the ConsensusDocs 300 (Lichtig 2005; Thomsen et al. 2009; Ballard and Howell 2005)⁵. In situations where signing a multi-party contract is prohibited, as is the case for some public entities, more traditional GMP and Lump Sum contracts can be modified to promote the behaviors of IPD and encourage the use of TVD (Darrington and Lichtig, 2010). The University of California San Francisco's recent hospital project was such an 'IPD-ish' project⁶. It is included in Denerolle's (2009) report on the design phase. Its construction phase and outcomes will be the subject of a future report from this research.

⁴ The Last Planner System is a registered trademark of the Lean Construction Institute (leanconstruction.org).

⁵ AIA (American Institute of Architects) forms of contract are also used on IPD projects, but do not specify lean management as the operating system.

⁶ We follow the common distinction in use of the terms "IPD" and "IPDish", but it may be more useful to think in terms of shared risk and reward, with different contractual means for achieving alignment of commercial interests.

2.3.1 Sutter Health's 5 Big Ideas

In 2004, Sutter held a conference with its service providers outlining their vision for the future (Macomber, 2004). At the time, Sutter was faced with a \$6 billion construction program. In the past years, many of their projects had been over budget, over schedule, did not deliver its intended value, and in some instances resulted in lengthy litigation. Their goal at the conference was to: "set out to transform how capital projects are designed and delivered. This initiative is noble and necessary. They believe that capital projects cost too much; they take far too much time; they often fall short of their objectives; and they kill or injure too many along the way. It need not be this way" (Macomber, 2004). With the help of Lean Project Consulting, Inc. Sutter developed their 5 Big Ideas as the foundation of their Lean Project Delivery System. These 5 Big ideas form the basis of the Integrated Form of Agreement, the first multi-party contract for Integrated Project Delivery (IPD), as well as other relational contracts such as the Consensus Docs 300 (Lichtig, 2005).

Sutter's 5 big ideas are used in this report to gauge the cultural outcomes of the project. The soft metrics of the cultural outcomes include: degree of collaboration, relatedness amongst the project team, learning, optimizing for the whole, and managing the project as a network of commitments (Figure 3). A survey was sent out to the project team and the outcome is included in the results section.

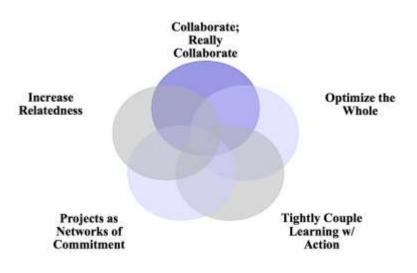


Figure 3: Sutter's 5 Big Ideas (Macomber, 2004)

Collaborate, Really Collaborate

" Constructable, maintainable, and affordable design requires the participation of the range of project performers and constituencies. Since abandoning the master-builder concept, and separating design from construction, we have been patching together a poorly conceived design practice. Value engineering, design assist, and constructability reviews mask an underlying assumption – that design can be successful when separated from engineering and construction. Design is an iterative conversation; the choice of ends affects means and available means affects ends. Collaborative design and planning maximizes positive iterations and reduces negative iterations." (Macomber, 2004)

Optimize the Whole

"Project work is messy. Projects get messier and spin out of control when contracts and project practices push every activity manager to press for speed and lowest cost. Pushing for high

productivity at the task level may maximize local performance but it reduces the predictable release of work downstream, increases project durations, complicates coordination, and reduces trust. In design, we incur rework and delays. In the field, this means greater danger. We have a significant opportunity and responsibility to reduce workers' exposure to hazards on construction projects. Doing so can bring about greater than 50% improvements in the safety on the work site. We are committed to do all that is possible so that the people who build these projects are able to go home each night the way they came to work. The way we understand work and manage planning can increase that messiness or reduce it." (Macomber, 2004)

Tightly Coupled Learning with Action

"Continuous improvement of costs, schedule, and overall project value is possible when project performers learn in action. Work can be performed so that the performer gets immediate feedback on how well it matched the intended conditions of satisfaction. Doing work as single-piece flow avoids producing batches that in some way don't meet customer expectations that later on must be reworked. The current separation of planning, execution, and control contributes to poor project performance and to declining expectations of what is possible." (Macomber, 2004)

Projects are Single Purpose Network of Commitments

"Projects are not processes. They are not value streams. The work of management in project environments is the ongoing articulation and activation of unique networks of commitment. The work of leaders is bringing coherence to the network of commitments in the face of the uncertain future and co-creating the future with project participants. This contrasts with the commonsense understanding that planning is predicting, managing is controlling, and leadership is setting direction." (Lichtig, 2005)

Increase Relatedness

"People come together on AEC projects as strangers. They too often leave as enemies. Facilities projects today are complex and long-lived, requiring ongoing learning, innovation, and collaboration to be successful. The chief impediment to transforming the design and delivery of capital projects is an insufficient relatedness of project participants. Participants need to develop relationships founded on trust if they are to share their mistakes as learning opportunities for their project, and all the other projects. This will not just happen. However, we are learning that relationships can be developed intentionally." (Lichtig, 2005)

3 Research methodology

3.1 Case Study Method

According to Yin (2009), the case study method is appropriate when: 1) asking "why" and "how" questions, 2) if the researcher has little control in the experiment, 3) if the focus is on a contemporary phenomenon within real-life context. Eisenhardt (1989) defines a case study as "a research strategy that focuses on understanding the dynamics of a single setting". A properly designed case study can be generalized and used to develop theories (Eisenhardt, 1989; Flyvbjerg, 2006). In order for a case study to be scientifically rigorous, its design and data collection practices must meet: 1) construct validity, 2) internal validity, 3) external validity, and 4) reliability (Yin, 2009).

Construct validity refers to the degree to which the research is measuring what it was designed to measure. Internal validity deals with the degree to which the causal relationships drawn by the research is warrant based on the data collected. External validity refers to the scope and boundary within which the findings from the case study can be generalized. And finally, the reliability of the research ensures that proper research protocols were taken so that other researcher can reproduce the results if they followed the same research steps (Yin, 2009).

In order to maintain construct validity, Yin (2009) recommends the following tactics: 1) use multiple sources of evidence, 2) establish a chain of evidence, 3) have key informants review the draft of the report. To maintain internal validity, Yin (2009) recommends using logical models and pattern matching techniques. To maintain external validity, Yin (2009) recommends using replication logic to compare the findings from multiple cases. And finally, to maintain reliability, the researcher should use a case study protocol and develop a case study database (Yin 2009). The research for this technical report follows Yin's (2006) recommendations in order to maintain construct validity, internal validity, external validity, and reliability. After writing the technical report, we asked project participants to review our draft to ensure accuracy.

3.2 Analytical framework

This study uses a modification of Denerolle's analytical framework (Denerolles, 2013; Table 2). The research framework for this study includes four major sections: (1) project definition, (2) steering to target during design, and (3) steering to targets during construction. Table 2 lists the key concepts and the portion of the existing TVD benchmark that references each component.

		Key concepts	TVD benchmark practices
Project Definition	Business Case	Access to owner's business case Whole life cost	With the help of key service providers, the customer develops and evaluates the project business case and decides whether to fund a feasibility study; in part based on the gap between the projects' allowable and market cost. The business case is based on a forecast of facility life cycle costs and benefits
	Stakeholder Values	Definition of value Link value directly to design components Scope changes	All team members understand the business case and stakeholder values
	Conditions of Satisfaction	Translating Stakeholder values into measurable outcomes	
	Forming the Team	Early involvement	The feasibility study involves all key members (designers, constructors, and customer stakeholders) of the team that will deliver the project if the study findings are positive.
	Lean Training	Training the project team on the basics of Lean philosophy, methods, and tools Promote and develop a Lean culture	
	Target Setting	How are the targets set? Linkage to business case	A cardinal rule is agreed upon by project team members – cost and schedule targets cannot be exceeded, and only the customer can change target scope, quality, cost or schedule. Targets are set as stretch goals to spur innovation.

Table 2: Analytical Framework Matrix

	Validating Targets	Ensuring that the targets are achievable	Feasibility is assessed through aligning ends (what's wanted), means (conceptual design), and constraints (cost, time, location, etc.).
			The project proceeds to funding only if alignment is achieved, or is judged achievable during the course of the project.
			The feasibility study produces a detailed budget and schedule aligned with scope and quality requirements.
	Contractual Structure / Sharing Risk and Reward	Contractual agreement Incentives, accountability	Some form of relational contract is used to align the interests of project team members with project objectives.
Steering to	Cross Functional	Clusters	The customer is an active and permanent member of the project
Steering to Targets During Design	Cross Functional Team For Design	Collaboration	delivery team. Target scope and cost are allocated to cross-functional TVD
			teams, typically by facility system; e.g., structural, mechanical, electrical, exterior, interiors, etc.
	Integrated	The cost, schedule	The project is managed by the people in the risk pool
	Governance	and quality implications of design alternatives are discussed by team members (and external stakeholders when appropriate) prior to major investments of design time.	
	Joint Responsibility and Transparency	Process for making decisions within a shared governance model which ensures that value is being delivered	IPD members share in the roles and responsibility of managing the project
	Co-location / Big Room Meetings	Allow for close collaboration and exchange of ideas	Co-location is strongly advised, at least when teams are newly formed. Co-location need not be permanent; team meetings can be held weekly or more frequently.
	Collaborative Design	Talking before	
	Conversation	drawing	
	Simulation of Operations	Simulate the operations of the space to inform its	
	Last Diaman f	design Coordinate and	The Last Planner [®] system is used to coordinate the actions of
	Last Planner for Design	organize key milestones and decision in the design phase	team members.
	Set Based Design	Eliminate negative iteration by keeping a set of feasible alternatives	
	A3s	Document improvements and decisions on a single page	
	Value Engineering	Reducing cost through innovation while maintain the desired functionalities, capacities, and quality	
	Cost Modeling and	Cost estimating	Cost estimating and budgeting is done continuously through
	Cost Tracking		collaboration between members of the project team—'over the

		Budget reporting	shoulder estimating'.
			TVD teams update their cost estimates and basis of estimate
			(scope) frequently.
	Building Information	BIM	
	Modeling		
	Risk Identification and	Identify, classify, and	
	Risk Management	mitigate risks	
	Moving Money	Transfer of money	
	Between Boundaries	and scope across	
	between boundaries	organizational	
		boundaries	
Steering to	Last Planner for	Coordinate the key	The Last Planner [®] system is used to coordinate the actions of
Targets	Construction	activities and	team members.
During		milestones during	
Construction		construction	
	Location Based	Integrate space and	
	Planning	time as a resource to	
		avoid trade stacking	
	Value Stream	Understand the value	
	Mapping	of a process so that	
		waste can be	
	Due e con Manualu a	eliminated	
	Process Mapping	Mapping out and standardizing	
		common processes	
	First Run Studies	Prototype a	
	First Rull Studies	production run to	
		learn and improve	
		Record trades at work	
		to find areas for	
		improvement	
	5 Whys Analysis	Learning from	
		breakdowns	
	Community of	Develop a group that	
	Practice	shares best practices	
		and continues the	
		Lean journey	
	Shared KPIs	Communicating and	
		sharing project and	
		production data with	
		the integrated team	

3.3 Data Collection Techniques

3.3.1 Interviews

Interviews are the main source of data for this research. To collect data from several different perspectives, the researcher conducted face-to-face and telephone interviews with the key participants from the UHS Temecula project. These interviews were semi-structured and typically lasted between 30 minutes to 1 hour (although some lasted much longer). The notes from the interviews were compared with other sources of data in order to triangulate the findings. Table 3 shows the list of interviewees, their title, and the date of the first interview. As an iterative process, the researcher maintained contact with several of the interviewees throughout the research in order to request for information, to ask for the context of the data, and to gather in-depth examples for this report.

Table 3: Interviewees on the case studies

UHS Temecula Valley

Name	Title	Date	
Scott Dater	Electrical Trade Partner	11/13/2013	
Jason Herrera	General Contractor (Drywall)	06/15/2015	
Kristen Hill	Lean Coach	07/20/2015	
Tara Laski	Owner's Rep	10/29/2013	
Ken Lindsey	Mechanical Trade Partner	12/17/2013	
Tom Mccready	General Contractor	11/05/2013	
Brent Nikolin	General Contractor	11/05/2013	
Bill Seed	Owner	10/17/2013	
Lee Tsangeo	General Contractor	10/25/203	
George Vangelatos	Architect	10/28/2013	
Steve Wilson	Architect	11/4/2013	
George Zettel	General Contractor	10/29/2013	

3.3.2 Document Analysis

In addition to interviews, several other data sources were used to expand the findings. By relying on several independent sources of evidence, the researchers were able to increase the construct reliability of the research. The additional data sources include:

- 1) Schedule and Budget Reports
- 2) Contract Documents
- 3) A3 reports
- 4) Lessons Learned Presentation
- 5) Other forms of documented information on the project (e.g., Excel files, photos, and videos)

The UHS Temecula Valley project was completed in August of 2013. One limitation of this research is that we measured TVD application after the project had been completed. People moved to different projects and their personal accounts may be distorted over time. In order to counteract this effect, the research carefully triangulated evidence from multiple sources and used documented data to support the interviews. One benefit of collecting data after the project has already been completed is that we can report on both the application and the outcomes. The lessons learned presentations that were collected by the participants at the end of these projects have been one such valuable resource of information.

3.3.3 Surveys

Two surveys were sent to the participant of the project. The first survey was sent to 9 participants of UHS Temecula on March 18, 2014. The survey asked the participants about the components of the TVD benchmarks and the Lean Construction methods (i.e., CBA, Set-Based Design, and A3 reports) that were used on their project. The second survey was sent out in September 2015. The second survey focused on the cultural outcomes of the project. The scale of the survey ranged from 1 to 5 (1 => highly disagree, 2 => disagree, 3 => neutral, 4 => agree, 5 => highly agree). This section discusses the outcomes of the first survey. The outcomes of the second survey are available in the results section.

The goal of the first survey was to gauge quantitatively the TVD application of the projects and to serve as starting point for more in-depth interviews. There were 6 respondents from the Temecula Valley Project. Although the number of sample points is too small to be statistically significant, the results from the survey gave a high-level picture about the TVD application. The results table included: (1) the component of the TVD benchmarks, (2) the mean score, (3) the lower range, (4) the upper range, and (5) the standard deviation. Standard deviations greater than 1 (highlighted in Table 4) indicate areas where

there were differing opinions between the participants. Standard deviations less than 1 indicate that there was more or less a consensus.

Components of the current TVD benchmark		Temecula			
(rated on a scale of 1 to 5)	Mean	Lowest Rating	Highest Rating	Stand. Dev.	
1. With the help of key service providers, the customer develops and evaluates the project business case and decides whether to fund a feasibility study; in part based on the gap between the project's allowable and market cost.	3.8	3	4	.5	
2. The business case is based on a forecast of facility life cycle costs and benefits, preferably derived from an operations model; and includes specification of an allowable cost—what the customer is able and willing to pay to get life cycle benefits. Financing constraints are specified in the business case; limitations on the customer's ability to fund the investment required to obtain life cycle benefits.	3.8	1	5	1.6	
3. The feasibility study involves all key members (designers, constructors, and customer stakeholders) of the team that will deliver the project if the study findings are positive.	3.8	1	5	1.6	
4. Feasibility is assessed through aligning ends (what's wanted), means (conceptual design), and constraints (cost, time, location,). The project proceeds to funding only if alignment is achieved, or is judged achievable during the course of the project.	4.4	3	5	.9	
5. The feasibility study produces a detailed budget and schedule aligned with scope and quality requirements.	3.8	2	5	1.3	
6. The customer is an active and permanent member of the project delivery team.	4.4	2	5	1.3	
7. All team members understand the business case and stakeholder values.	4.4	3	5	.9	
8. Some form of relational contract is used to align the interests of project team members with project objectives.	4.8	4	5	.5	
9. A cardinal rule is agreed upon by project team members – cost and schedule targets cannot be exceeded, and only the customer can change target scope, quality, cost or schedule.	3	1	5	1.6	
10. The cost, schedule and quality implications of design alternatives are discussed by team members (and external stakeholders when appropriate) prior to major investments of design time.	4.4	3	5	.9	
11. Cost estimating and budgeting is done continuously through intimate collaboration between members of the project team—'over the shoulder estimating'.	4.2	3	5	.8	
12. The Last Planner [®] system is used to coordinate the actions of team members.	4.4	3	5	.9	
13. Targets are set as stretch goals to spur innovation.	4.2	3	5	.8	
14. Target scope and cost are allocated to cross-functional TVD teams, typically by facility system; e.g., structural, mechanical, electrical, exterior, interiors,	4.8	4	5	.5	
15. TVD teams update their cost estimates and basis of estimate (scope) frequently. Example from a major hospital project during the period when TVD teams were heavily in design: estimate updates at most every three weeks.	4.4	3	5	.9	
16. The project cost estimate is updated frequently to reflect TVD team updates. This could be a plus/minus report with consolidated reports at greater intervals. Often project cost estimates are updated and reviewed in weekly meetings of TVD team coordinators and discipline leads, open to all project team members.	4.4	3	5	.9	
17. Co-location is strongly advised, at least when teams are newly formed. Co-location need not be permanent; team meetings can be held weekly or more frequently.	5	5	5	0	
18. Set-Based Design was used in the design stage.	4	3	5	1	
19. Choosing By Advantages was used to select between alternatives.	4.8	4	5	.5	
20. A3s were used to document design alternatives.	4.8	4	5	.5	
21. A3s were used to solve problems.	4.4	4	5	.5	
TVD SCORE (%)	85.7%				

 Table 4: Results from a Survey Conducted to Rate the Implementation of the TVD Benchmark

Out of the 21 questions, five questions had a mean score of less than 4.0 and five had a mean score greater than 4.5. For the questions with low scores, our goal is to determine why the respondents believe that the benchmark was not achieved. For the questions high scores, our goal is to collect evidence to show how these benchmarks were accomplished on the project and report these practices. There are five questions with a standard deviation greater than 1. The relatively high standard deviation suggests that there is a disagreement between the respondents about the degree to which a benchmark was achieved. Our goal for the questions with the high standard deviation is to investigate the root cause of this disagreement.

The questions with scores lower than 4.0 are: question 1, question 2, question 3, question 5, and question 9. Questions 1, 2, 3, and 5 all pertain to the business plan, validation study, setting the target cost based on the business plan, and developing the target cost with the key participants. According to the interviewees, the owner did not involve all the key trades in the development of the target cost and the business plan. The history of the project shows that the owner engaged with 3 teams each consisting of an architect and a general contractor for a design competition. The results of the design competition and the owner's financial constraints formed the basis for the business plan, the target scope, and the target cost. It appears that some of the trade partners that entered the project later during the design phase were not as informed about the basis of the target cost.

Question 9 had the highest standard deviation and the biggest range with the owner giving a score of 5 and a trade partner giving a score of 1. Based on the interviews that were conducted after the survey and other sources of data, we believe that some people may have interpreted the question incorrectly. The data revealed that the cost and schedule objectives were accomplished. The only major changes in scope were the addition of a cardiovascular center and a helipad initiated by the owner. The Target Cost increased by \$7 million for the cardiovascular center and \$500,000 for the helipad.

The questions with standard deviations greater than 1.0 include: question 2, question 3, question 5, question 6, and question 9. The reason for the high standard deviations for questions 2, 3, 5, and 9 were explained in the previous section. Question 6 pertains to the owner's role and commitment to be a permanent and active participant in the project delivery. Only one survey respondent rated a low score while all the other respondents rated a high score for this question. The follow-up interviews revealed that the owner was very actively involved in the project and most likely the high standard deviation observed in this question is due to noise that arises from analyzing data from such a small sample size.

3.3.4 Target Value Design Research Group Meeting

The UC Berkeley's Target Value Design Research Group includes 12 members within the Northern California AEC industry including: a general contractor, MEP trade partners, architects, electrical engineer, structural engineers, and specialty contractors. The TVD Research Group was formed in 2010 with the goal of improving TVD and Lean application on design and construction projects. In 2010, TVD and IPD were fairly new concepts and the group wanted to learn from and improve their Lean project delivery. Since the inception of the group, the members met regularly with the researchers from UC Berkeley to discuss findings on their case study projects. These research meeting took place every 2-3 months, typically on a Friday and lasted from 10am to 2pm. The researchers from UC Berkeley would present new findings on the five case study project (including the Temecula Valley project) and the people who were involved on the project would be engage in the discussion, clarify the issue, and correct any misunderstanding. By using the TVD Research meetings as a forum, this research benefited from: (1) ensuring that the research questions were relevant to the industry, (2) leveraging the

experiences of industry practitioners in the development of the research, (3) gathering rapid feedback on the findings, and (4) having the people involved on the project to ensure the accuracy of the findings.

4 Research Findings

4.1 **Project History**

Founded in 1981, UHS is one of the largest healthcare providers in the United States with approximately \$8 billion of revenue annually (UHS, 2012). They are organized as a non-profit organization and provide services in Washington D.C., Puerto Rico, and the U.S. Virgin Islands (UHS, 2012). In 2012, UHS spent \$363 million on capital expenditures, which includes renovations of existing buildings and new construction of healthcare facilities (UHS, 2012). In California, UHS has 7 hospitals dedicated to Behavioral Health Services, 5 hospitals dedicated to acute care services, and one ambulatory surgery center (Surgery Center at the Temecula Valley) (UHS, 2014). Annually, they commission over 100 construction projects – most of these projects are small renovation projects but there are several large-scale construction projects as well (Seed, 2013).

UHS started using Lean after hearing about the success from Sutter Health, Inc. at a conference in March of 2007. They contacted Greg Howell from Lean Project Consulting, Inc. to help them get started on their Lean journey. Since 2007, UHS has completed over 40 Lean IPD and TVD projects and have 60 projects in development/construction (Seed, 2014). Out of their 40 completed Lean IPD and TVD projects, they have not had any major problems and are very happy with the outcomes. These projects have typically been completed 10% to 30% below market price (Seed, 2014). For the Temecula Valley project, UHS also expected to achieve the same outcomes, implementing lean from the beginning of the project.

The project was originally designed in 2008. It was re-assessed in late 2009 at which point UHS realized that the cost was more than they can afford. At that time, the owner (UHS) had developed a business plan based on market research of the area's demographic to determine their anticipated revenues from the hospital services. If they could not build the project within their cost constraint, the project would not proceed any further. The re-assessment process started with 3 teams each composed of one architect and one contractor. The teams were tasked with developing a design that could be completed for 30% below historical cost benchmarks for a California hospital. The 30% stretch goal was created by the owner to meet their budget constraints and was based on their assessment of potential increases in efficiency by using IPD. The combination of UHS's internal budget for the project and the design proposals (including the challenge to develop a design that is 30% below the California cost benchmarks) formed the basis for the target cost. After reviewing the proposals, UHS decided that two of the teams had good ideas that they wanted to incorporate into the project and had the two GCs and two architects form a joint venture. In the construction industry it is more common for GCs to form a Joint Venture than for architects to do so. At the end of the schematic design, HMC remained as the architect since the difficulties of organizing and integrating two architects was greater than its benefits. DPR and Turner formed a Joint Venture as the General Contractor. Besides the design proposals, there were no other formal validation studies conducted for the project.

4.1.1 Lean Training at Temecula Valley

Kristin Hill from Inside Out Consulting was involved for 7 months during the design phase. She first came onboard in Q4 2010 when the project cost was at its highest point. She left the project in Q2 2011 just before the start of construction. Her role as a Lean Construction coach was to: (1) help the team develop their TVD process, (2) to teach Lean Construction methods, tools, and concepts, and (3) to help the team become self-sufficient in continuing the Lean culture. During the construction phase, the Lean training

was a joint effort by Turner, DPR, Southland, and UHS. Each person who joined the project (project managers, project engineers, and field supervisors) had to go through an onboarding orientation, which covered the basics of Lean Construction, the project's culture, owner's goals, and the project's expectations. The onboarding orientations took place monthly or more frequently depending upon the needs of the project. In addition to the training, each member was also given an onboarding manual. For the field staff, there was a condensed version of the training, which lasted half a day. People who had not gone through the on boarding process could not attend the big room meetings.

4.1.2 Project Timeline

The TVD/IPD team entered the project in March of 2010 with a GMP contract. In April of 2010, the design was approved by the city council. In February of 2011, the TVD/IPD team signed the ConsensusDocs 300. Increment 1 & 2 OSHPD documents were submitted in February of 2011. The key dates for the construction phase include (Figure 4):

- Groundbreaking June 2011
- Start of foundation work August 2011
- Start of steel erection November 2011
- Steel topped out February 2012
- Roof deck placements March 2012
- Project completion August 2013
- Hospital open for the first patient October 2013

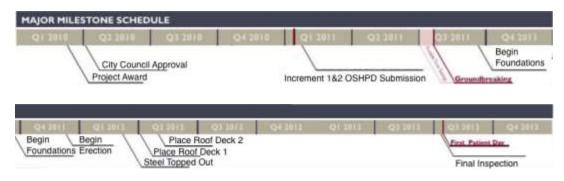


Figure 4: Major Milestone Schedule

4.1.3 Forming the Project Team

During the schematic design phase, DPR-Turner, HMC, and UHS used Choosing By Advantages (CBA; Suhr, 1999) to select the remaining TVD/IPD members. They determined the trades that would be the major drivers for the project (e.g., MEP, fire protection, drywall). The criterion for choosing the disciplines to include in the risk pool was: does the work have large impact on the success of the project? The impact on project success can be measured by high contract value, critical path work, or work that needs to be highly coordinated. They developed a shortlist of 3 to 5 trades for each discipline and evaluated the candidates based on the following factors: (1) company experience, (2) qualification of project staff, (3) proposed design solution, (4) BIM capabilities, and (5) QA/QC process. Part of the selection process included a discussion of the overhead, profit, and personnel billing hours of each discipline. The team members that were already selected vetted the numbers to make sure that they were consistent with the market rates. They did not conduct a formal audit for each company. The team

used CBA⁷ because they wanted a formal process to select the best company and the best people to work on the project.

Factors	Criteria				Design Assist Steel			
			Company 1		Company 2		Company 3	
Company Experience	Must have high rise experience	Attribute	\$400 to \$500 MM company value. \$150 M in Socal. Has in- house design capabilities through Jay.	Importanc e	\$225 M company. \$80 M in Socal. 1000 employees doing a very good job on the 49ers stadium	Importance	\$500 M to \$600 M value. They completed LA Live	Importance
		Advantage						
Staff Qualificati on	Strong project manager with DA Experience	Attribute	Jay is very qualified engineer. PX has local experience and foreman is very solid	Importanc e	Solid team. I see less depth on the design support	Importance	Bob, Lee, and Randy have good local experience	Importance
		Advantage						
Design Solutions	Ability to meet design requireme nts	Attribute	Jay offered an alternative that enables a 1.3' floor height reduction	Importanc e	Recommend the use of grade 65 steel. Generally not as strong on the design side	Importance	They have support many of the design solutions that have been studied to date.	Importance
		Advantage						
Project Approach	Innovative ideas such as prefabricati on	Attribute	Very active design assist team. Very solid understanding of the schedule requirements	Importanc e	Can improve the schedule by 1 month. Solid experience builder	Importance	Will buy plates overseas and fabricate either in CA or Asia	Importance
		Advantage						
proposal with	with reasonable	Attribute	They have the labor risk and use limited risk on shapes	Importanc e	Have price protection through Nucour	Importance	Lead the proposal developmen t process	Importance
	assumption s and clearly defined exceptions	Advantage						
Value Ideas	Provide innovative design and	Attribute	Use cable brace at column support. Use cap	Importanc e	Use a shipbuilder to fabricate	Importance	Propose linking the steel,	Importance

Table 5. Choosing By Advantages Example

⁷ Note that CBA, like Best Value Selection processes, separates qualifications and cost, but CBA does not weight qualification criteria or cost and Best Value Selection processes do.

		-						
	constructio n solutions	Advantage	plates at column splices		the plates. The ship builder is offering \$4.5 M in savings		concrete, decking, and curtain wall through a GMP with savings participation	
BIM Capabilitie S	BIM capabilities for design developme nt, clash detection, and as- built drawings	Attribute	5 modelers in- house use of etabs, tekla, navis	Importanc e	In house modeling and detailing. Has been 100% BIM for fabrication for the past 10 years	Importance	Full modeling capabilities	Importance
		Advantage						
QA/QC Process	Well defined QA/QC process	Attribute	Will QC any offshore purchased material	Importanc e	Full QC in the shop with 3 rd party Nasco	Importance	Will provide QC for any offshore materials and utilize third party inspections	Importance
		Advantage						
Importance	of Advantages							
Cost								

The 7 members that formed the TVD/IPD team included:

- Owner Universal Health Services
- Architect HMC Architects
- General Contractor DPR-Turner Joint Venture
- Electrical Design Assist Contractor Bergelectric
- Mechanical and Plumbing Design Assist Contractor Southland Industries
- Drywall and Framing Contractor DPR Drywall
- Fire Protection Design Assist Contractor Southwest Fire Protection

Figure 5 shows the onboarding schedule for the both the members within the risk pool and the members outside the risk pool. This figure was taken from an internal presentation and is presented without modifications.

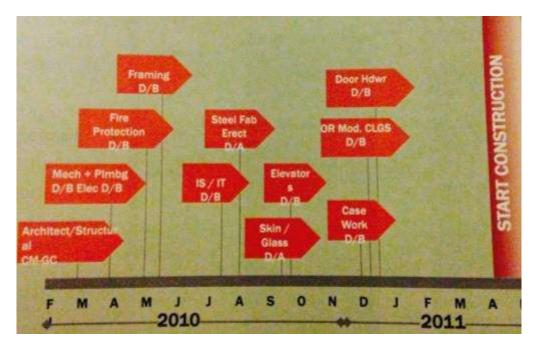


Figure 5: Onboarding of Team Members

4.1.4 Contractual Structure

During the design stage of the project, which lasted from March of 2010 until February of 2011, the TVD/IPD team was paid a not-to-exceed time and materials contract. In February 2011, the team signed the ConsensusDocs 300, which then covered both the construction and design phase and superseded the prior agreement. The ConsensusDocs 300 is a relational contract inspired by the Integrated Form of Agreement (IFOA) (Lichtig, 2005; ConsensusDocs, 2013). The ConsensusDocs series of contracts were developed by a coalition of 36 members from the construction industry including: "Design Professionals, Owners, Constructors, Subcontractors, and Sureties [to] literally spell the [word] DOCS in ConsensusDocs" (ConsensusDocs, 2013). The goal of the coalition was to create a set of contracts that fairly allocates risks and do not unjustly favor one party over another (ConsensusDocs, 2013).

The ConsensusDocs 300 includes terms that stipulate: (1) the use of Lean Construction principles, (2) a Management Group composed of the IPD members, (3) Target Value Design is used to ensure that cost and schedule constraints are taken into account by designers, (4) pain/gain sharing between the IPD members, (5) cost of work is reimbursed, with open book accounting practices (e.g., the right to audit), and (6) disputes are resolved collaboratively by the Management Group (ConsensusDocs, 2013). UHS made minimal modifications to the contract template and only altered the agreement to allow for 7 parties instead of the original tri-party agreement. The 7 members of the TVD/IPD team signed the ConsensusDocs 300 in February of 2011 (Figure 6). According to the Temecula Valley team, the signing of the contract was a "symbolic event" with all the key members present – there was no mailing in of signatures.

Figure 6: ConsensusDocs 300

4.2 **Project Definition**

4.2.1 Business Case

The business case for the Temecula Valley project was developed by UHS based on their market research and the anticipated revenues from the hospital over its lifetime. The business case reflected the fact that the hospital is in a rural region of Southern California, the demographics of the area, and new healthcare legislation in the United States (The Affordability Care Act), which will impact future revenues. The initial cost estimate for the project was \$149.4 million dollars for 140 patient beds. The Target Cost was set at \$144 million dollars, which is an average of \$1.1 million/patient bed, substantially under the average for California hospitals of \$1.8 million/patient bed.⁸

4.2.2 Stakeholder Values

The programming for the hospital called for 140 patient beds (120 medical/surgical and 20 ICU). All of the beds had to be private rooms with their own window view. The program also includes: (a) an emergency department, (b) six operating rooms, (c) one minor procedure room, and (d) a helipad. The only major changes to the scope of the project were a \$6.8 million cardiovascular center that was added in late 2011 and a \$500,000 helipad. The addition of the cardiovascular center and the helipad increased the Target Cost from \$144 million to \$151 million.

During programming and schematic design, the team collected inputs from a number of internal and external stakeholders to gather requirements and inform the design. Figure 7shows the different groups of stakeholders involved in the program development.

⁸ The average \$1.8 million cost per bed includes all hospitals in California, with no adjustment for size, functionality or location. It is also relevant to note that this metric is becoming less useful as the average duration of patient stays in hospitals decreases.

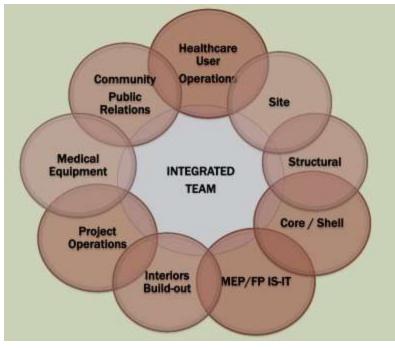


Figure 7: Integrated Team

The vision for Temecula Valley Hospital is "to deliver exceptional and compassionate patient care". To achieve this vision, the requirements for the hospital project included:

- 140 patient beds with the ability to expand to 320 beds in the future
- 24-hour visiting
- 28 private treatment rooms for outpatient services
- 20 intensive care unit (ICU) beds
- High-tech surgical suites and a minor procedure room
- Cardiac catheterization laboratory
- Cardiovascular operating room
- Central operations center
- In-room computer workstations for timely and accurate documentation
- 100 percent electronic medical records, in-room charting, and other technology enablers
- Training room for technology
- 24-hour room service for patients
- In-room physical therapy
- Full-service kitchen with seating for 100
- Ample parking for patients, visitors, physicians, and employees
- Final build out entitled for up to three medical office buildings

The key patient-care features included:

- Optimum lighting levels
- Noise reduction strategies (operational and architectural)
- Care areas designed to minimize walking distances for staff
- Room-service dining and guest trays for visitors
- Bistro-style coffee shop
- Outdoor dining
- Home-like waiting areas

- Family sleep zone
- Local art

4.2.3 Conditions of Satisfaction

UHS established the following conditions of satisfaction:

1) Project Delivery Success

- Maintain Conditional Use Permit by securing major modification approval in November 2010
- Maintain or reduce the Target Value Cost of \$144M for 140 beds
- Deliver the Owner's Manual six months prior to opening (approximately 3rd quarter 2012)
- Certificate of Occupancy by the 1st quarter of 2013
- Construction safety

2) Project Team Participation and Satisfaction

- Every team member firm finishes this project with a profit
- Predictable outcomes as a result of labor efficiency
- Reliability and trust as shown by measuring promises made versus promises kept

3) Community and Social Responsibility

- Positive press in the local and regional press
- Physician buy-in as reflected by hiring rates
- Neighborhood satisfaction survey to be conducted

4) Relationships with Regulatory Agencies

- Maintain promise of UHS being OSHPDs best customer
- Zero defects in all agency submittals
- Drawings in OSHPD possession for a time period 15% lower than the lowest established records
- "No excuses" surrounding OSHPD, City, etc. for not meeting COS, milestones, etc.
- Trade partners considered a business partner of OSHPD at the completion of the project

5) Facility Operational Success

- 30% more operationally efficient than the best performing UHS facility
- Patient Family Centered Care Delivery and Design reflected by HCAHPS scores⁹.
- Safe Patient Care Environment
- Community endorsement by the use of our facilities versus others in the area

4.2.4 Target Setting

"Recognizing a need for healthcare services in the Temecula Valley, UHS embarked on a traditional design-bid-build process in 2005 to construct a new hospital in Temecula. The hospital was first designed by a Texas-based architectural firm in 2006 with 173 beds and expansion capability up to 320 licensed beds using a reinforced concrete and precast structure. The plans were submitted to the Office of Statewide Health & Planning Development (OSHPD) in 2007 and approved in 2008. The design received

⁹ http://www.hcahpsonline.org/StarRatings.aspx

approval from the City of Temecula ('entitlements'), an environmental impact review was conducted, and construction drawings were completed. The project was placed on hold in 2008 when the economy slowed and the population growth in the community was predicted to decrease. In the meantime, the City entitlement expiration date grew closer and OSHPD approval of a similar project with precast concrete encountered challenges and delays. The Temecula Valley Hospital project was revived in December of 2009 with a concept for a smaller hospital that did not require precast concrete. UHS issued a request for qualifications to three design firms, asking them to select contractors to form self-directed teams to validate the new concept." (UHS, 2014)

The target cost was set by three different requirements: (1) UHS' anticipated revenues from the area, (2) UHS' limited budget for the project, and (3) UHS' challenge to the three design teams to develop a concept that is 30% below the historic market average. UHS believed that they could delivery the project well below the market average because the team would be integrated and thus be able to reduce waste in traditional project delivery systems. Due to UHS' limited funds for the Temecula Valley project, there would be no project if none of the teams can develop a concept that is within their requirements.

The original¹⁰ target cost of \$144 million was a result of the design competition. At the end of the design competition, the concept from the Turner team was chosen by UHS as the most economical approach. Turner validated the Target Cost with a financial benchmark of their historic urban and green field hospital construction (Figure 8 and Figure 9). The team kept the estimate dynamic and updated it on a weekly basis.

"There might be one section of the estimate that needed to be revised and so we updated it. Maybe the next week, there was a discussion on the structural system. We have a variance every week. We would do a total project re-estimate every 6 weeks. We used the models to pull out quantities." – General Contractor

¹⁰ The initial target cost did not include the cardiovascular center and the helipad.

Turner Benchmark Comparison

	Large Urban Hospitals Building Asse 177,837 gaf Entwate / GMP Date 1/1/2011 Examination 1/1/2011		Small Greenfix Builting Ave Entenne : GMP Date	77,637 gst	UHS Terrecula I Occupancy Target Estimate Buildig Avia 177.637 (pl Lyeads / SMP Terr (17/2011		
			Excatated to 1/U2011		Excalated to U1/2011		
Cost Summary	Totare	Unit Costs	Totais	Unit Cests	Totale	Unit Costs.	
Demultize & Patching	\$2,891,058	\$16.29	\$281,091	\$1.58	\$0	\$0.00	
Excavation 6 Paundations	\$6,421,550	\$30.15	\$4,562,845	\$36.95	\$5,318,722	\$18.68	
Dittactuated #reamon	\$12,533,990	\$70.56	\$8,732,233	\$49.16	\$8.096,264	\$45.58	
Rarfing & Waterproofing	\$2,323,624	\$13.08	\$1,494,016	\$8.41	\$1,389,895	\$7.82	
Esterior Wall	\$6,630,998	\$36.51	\$3,801,268	\$21.96	\$4,206,606	\$23.49	
Interior Finishes & Partitions	\$21,010,080	\$121.85	\$17,594,759	\$99.05	\$16,734,383	\$94.21	
Renolal Requirements/Equip.	\$1.924,435	\$10.83	\$792,860	\$4.46	\$1,682,724	\$9.47	
Vertical Transportation	\$2,400.095	\$13.51	\$886,417	\$4.99	\$1,340,700	\$7.55	
Fire Protection	\$1,354,778	\$7.63	\$1,476,381	\$8.31	\$1,295,131	\$7,29	
Phandalang	\$9,067,146	\$51.04	\$7,237,433	\$40.74	\$13,252,850	\$74.61	
HVAC	\$13,529,137	\$76.16	\$12,296,285	\$68.22	\$12,658,463	\$71.26	
Electrical	\$14,325,122	\$80.64	\$11,579,199	\$65.18	\$12,897,600	\$72.65	
Southernal Building	\$95,223,555	\$536.06	\$72,834,787	\$410,02	\$76,875,348	\$432.77	
Bata-serverile.	\$0	\$0.00	50	\$0.00	\$0	\$0.00	
Tenant Finishes	80	\$0.00	\$0	\$0.00	80	80.00	
Telefitidad	\$95,222,555	\$536.06	\$72,834,767	\$410.02	\$76,875,348	\$432,77	
P&P Bond	\$1,122,637	\$6.32	\$480,935	52.71	\$0	\$0.00	
Construction Contingency	\$3,782,386	\$21.29	\$1,543,233	\$4.65	\$3.670.867	\$20.66	
Garrenzi Cenditione	\$11,373,827	\$64.03	\$7,745,558	\$43.60	\$4,251,000	\$23,93	
General Regutrements	\$2,889.724	\$16.27	\$2,486,451	\$13.99	\$2,685,571	\$14.56	
Investments	\$2,669,845	\$14.02	\$1,128,032	\$6.36	\$2,649,917	\$14.92	
Background th	\$461,201	\$2.60	\$0	\$6.00	\$6	\$5.00	
Faa	\$3,501,473	\$19.71	\$2,835,132	\$16.52	\$2,943,456	\$16.57	
Gumbleood Markups	\$25,620,895	\$144.23	\$16,319,200	\$91.87	\$16,100,611	\$90.64	
Yotut Cool	\$120,844,450	\$680.29	\$80,153,087	\$501.89	\$92,575,851	\$523.40	

Figure 8: Cost Benchmarking

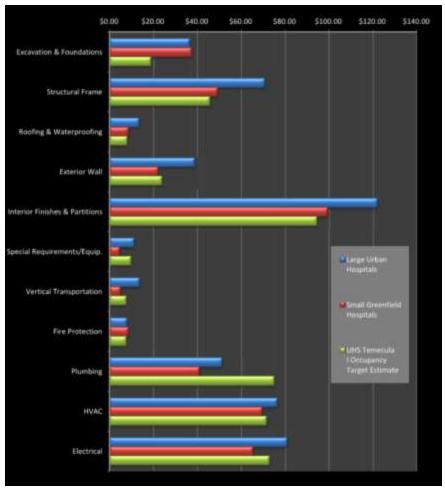


Figure 9: Components of Cost Model

Figure 10 shows how project costs were broken down. From the total estimated cost of work (\$149.358.000) the TVD/IPD team carried 83%. The remaining 17% were contracted out to GMP and Lump Sum trade partners. The contingency was set at ~3% of the project cost and is significantly lower than on projects that do not use TVD/IPD (Do et al., 2014).

As part of the agreement, cost overruns first come out of the team's contingency and profit pool. The owner will pay for all cost of work (no profit) beyond the depletion of the contingency and risk pool. Any savings will be shared 50/50 between the TVD/IPD team members (i.e., risk pool members) and the owner. The team is able to earn up to 150% of their negotiated profits with any additional savings beyond 150% of their profit returned to the owner. During the project, the owner reimburses the team based on their cost of work¹¹ (i.e., actual invoices) and anticipated profits are dispersed to the team at regular intervals. Out of the \$116 MM of work that was to be performed by the risk pool members, their negotiated profit was \$4.2 MM¹² and \$4.4 MM was set for the project contingency. The project

¹¹ Cost of work includes all the direct and indirect cost for the companies inside the risk pool. Direct cost includes personnel salaries, medical insurance for workers, and retirement fund contribution. Indirect cost includes corporate overhead (marketing, accounting, etc.)

¹² In accounting terms, the negotiated profit for the risk pool members is the net profit. The firm's overhead costs are included in their cost of work (Figure 10).

contingency was a fix amount of money allocated to absorb unanticipated problems (e.g., differing site conditions, environmental impacts, unanticipated escalations, design mistakes). Any money that was not spent from the team's contingency pool would become part of their shared profit. Material and labor escalations were included in the cost of work as a line item. Parties outside the risk pool performed the remainder of the work (\$24.4 MM).

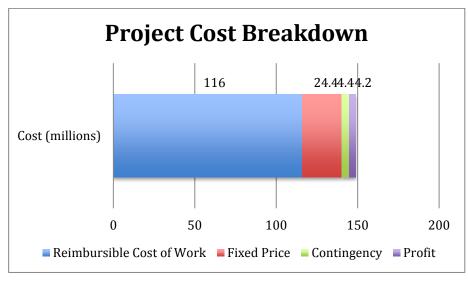


Figure 10: Initial Target Cost (\$151 million)

The Interviewees provided several reasons for a lower contingency:

- Since the contractors are involved in the design phase and the team is steering the design towards a Target Cost, there is less risk of cost overruns.
- The project team members pooled their contingency together and therefore less contingency was needed to cover the same amount of risk.

The project contingency covered: (1) errors and omissions, (2) rework, and (3) escalation of labor and materials. By the time of signing the Consensus Docs 300, the team had already completed most of their construction documents and had already locked in the prices for their materials (e.g., steel, conduits, pipes) so there was less risk of escalation. Since the construction phase was relatively quick (14 months total), it was possible for the Temecula team to lock in the prices of their most essential materials. For projects with much longer durations, there may be the question as to who bears the risk of material escalation. Standard practice is to carry a separate contingency for escalation, and maintain it as long as the team as a whole, owner included, consider it to be needed.

Each company had a negotiated profit based on their respective business models¹³. The profit for the whole TVD/IPD team was fixed and they placed 100% of it into the risk pool. The total profit pool is the summation of each company's negotiated profit times their total cost of work ($Profit_{total} = \sum_{i=1}^{n} Cost \ of \ Work_i \times Negotiated \ Profit_i$). Table 6 shows the percentage of the risk pool for each of the companies. Note that although Southwest Fire only held 1.5% of the risk pool profits, they were included as a TVD/IPD member because their scope of work is critical to the success of the project and highly interdependent with other trades.

¹³ The exact profit margins of each company are not listed in this report for confidentiality reasons.

Table 6: Percentage in Risk Pool

Company	Percentage in the Risk Pool
НМС	17.9%
DPR/Turner JV	30.5%
Southland	25.7%
Bergelectric	14.6%
Southwest Fire	1.5%
DPR Drywall	9.8%
Total	100%

4.2.5 Expected Cost During Design and Construction

Figure 11 shows the expected cost of the project throughout the design and construction phase.

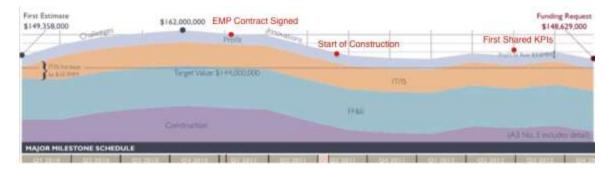


Figure 11: Expected Cost Throughout the Project

Figure 12 shows the expected profit of the team. The team tracked the expected profit during construction. The black area indicates the amount of profit that had been realized.

When the joint venture was formed in January 2010, there was a \$5 MM gap between the expected cost (\$149 MM) and the target cost (\$144 MM). This gap corresponded to about 3.5% of the target cost (Figure 11). When the major trade partners onboarded the project in Q1 and Q2 of 2010, the gap between the expected cost and the target cost had grown to \$9 MM. The root causes of the increase in the expected cost are documented in Figure 53. In Q2 and Q3 of 2010, it was uncertain if the team could achieve the Target Cost. Bill Seed's (VP of construction from UHS) leadership was instrumental in keeping the team together and getting them to focus on driving the design to the Target Cost. Confident that the team would be able to achieve the Target Cost, UHS continued to develop the design. By the beginning of 2011, the TVD/IPD team's estimate was still above their Target Cost but they were heading in the right direction. In February of 2011, the gap between the estimated cost and the Target Cost was \$7 million. And although there was still a ~5% gap to close, the team and the owner trusted each other and believed that if they continue with their Lean processes, they should be able to close the gap and ensure that all the members earn a profit. This was a leap of faith for both the owner and the team. If the project was to be completed at the estimated cost, the team would earn zero profit and the owner would have to pay more than their allowable cost. It is important to note that both the owner and the team were well aware of the financial situation when they signed the multi-party contract. In 2010, the state of California was in a recession caused by the housing bubble. There were not many projects at the time,

which is why the team was willing to sign the multi-party contract because it would allow them to keep their employees.

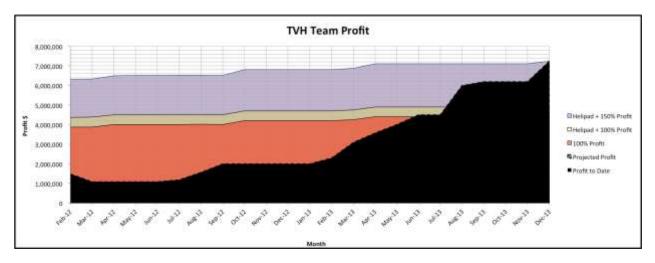


Figure 12: Expected Profit (Tracked During Construction)

4.3 Steering to Targets During Design

4.3.1 Cross-functional Teams For Design

The project teams were organized into 7 cross-functional clusters (Figure 13). The clusters allowed for efficient communication within the cluster group and dispersed the decision-making to the cluster and cluster leads. For example, MEP, Fire Protection, and Information Technology trades were placed in the same cluster because there is high level of interaction and coordination between these trades. The cross-functional clusters were:

- MEP/Fire Protection/ Information Technology
- Schedule/Project Systems/Agencies
- Core/Shell/Envelope
- Planning/Operations/Architecture
- Site/Community
- Budget
- Core Croup



Figure 13: Cluster Groups

The team's guiding principle for the project was to: (1) have trusted, qualified, and profitable partners, (2) provide a creative and innovative environment, and (3) make learning a priority. Early on, the team identified events or activities that can have a major impact on cost, permitting, and schedule. After these activities were identified, cross-functional teams were created to focus on them. The goal of their cluster groups was to be "problem" focused. It was okay to assemble or re-assemble the cluster groups as needed. For example, when the core/shell group was no longer needed, they dismantled the group so that people could focus in other areas. They kept reassessing the necessity of the cluster groups. According to one interviewee, "the tricky part was making sure that each of those clusters were communicating with other clusters and reporting the information in Big Room meeting".

For the majority of the design phase, the integrated team was divided into 7 clusters (Figure 13). Each of the clusters was responsible to deliver their scope of work within their part of the project target cost, but both scope and money could move across clusters when doing so improved total project performance. Each cluster had a designated cluster lead responsible for decision-making and conflict resolution within his or her cluster. The core group, which consists of representatives from the owner, contractor, and architect, managed issues that relate to more than one cluster. In terms of decision-making and conflict resolution, most decisions were made at the cluster level or individual level. The core group only intervenes in situations that could not be resolved or in situations where there is a major impact (e.g., schedule, cost, quality).

The organizational structure promotes the flow of communication between the cluster groups and the core group (Figure 14). There were no legal or contractual boundaries that inhibited communication.

Figure 14 and Figure 15 show the interaction between the integrated team and the clusters. The integrated team is composed of the cluster leader. Both the integrated team and the cluster groups held regular meetings throughout the project. The integrated team met less frequently than the cluster groups (2x per week vs. daily). After every 3 weeks, the teams have a dedicated session for reflections (Figure 14). To promote dialogue, they organize their reflections into: (1) start doing, (2) stop doing, and (3) keep doing.

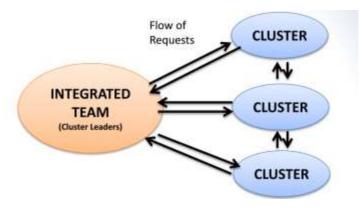


Figure 14: Flow of Requests and Communication

	INTEGRATED TEAM	CLUSTERS
Pull Plan Level	Macro	Micro
Check-ins Occur	2x per week	Daily or As-Needed
Vilestones Come From	Master Schedule	Macro Pull Plan Commitments
Hand-offs Between	Cluster Leaders	Cluster Members
Break Down Work	1 week max	2 day max
Reflections	Every 3 weeks	Every 3 weeks

Figure 15: Role of Integrated Team and Clusters

Figure 16 shows a typical daily check-ins and meeting schedules for the clusters and the core team. On Tuesdays, the integrated team (i.e., cluster leaders) would meet and conduct a macro-level pull plan for the project. Based upon the commitments of the cluster leaders on Tuesday, each cluster group would update their micro-level pull plan.

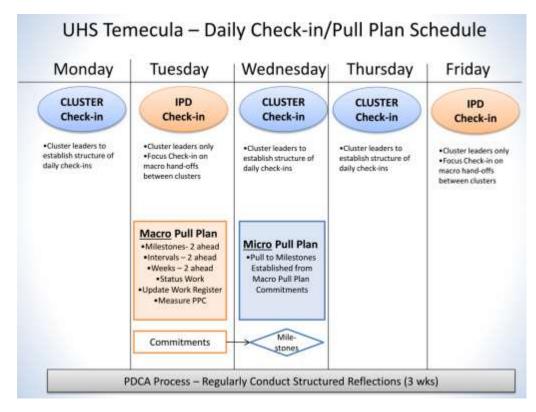


Figure 16: Daily Check-ins and Meeting Schedules

One goal of the project organization is to place the responsibility for design, estimate, schedule, and construction within each cluster group. The integrated team aggregates the data from the clusters to create the project budget and schedule. This practice avoids breakdowns and miscommunications (Figure 17).

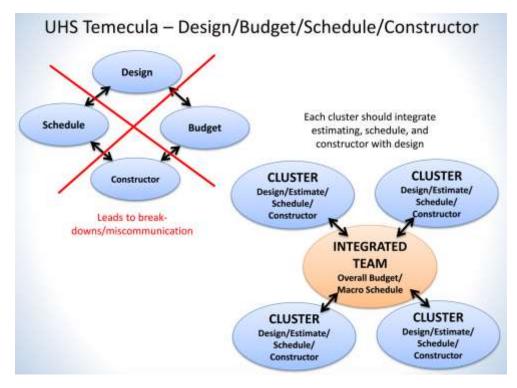


Figure 17: Design, Estimate, Schedule, Construction Responsibilities within Clusters

4.3.2 Integrated Governance

The integrated governance structure includes four distinct roles: (1) core group, (2) community of practice, (3) cluster leaders, and (4) cluster members (Figure 18; Figure 19).

The core group consisted of the members from the owner, contractor and architect. Their role is to coordinate, manage the overall day-to-day work, and ensure that the project is being delivered according to Target Value Design and Integrated Project Delivery principles. The core group had regular meetings and was ultimately responsible for solving problems that could not be resolved by the cluster teams. They signed off on major design decisions including decisions that required CBA and A3 documentations.

The community of practice included members from the owner and TVD/IPD team. All members of the TVD/IPD had to have at least one representative within the community of practice¹⁴. The goal of the community of practice is to advance the team's application of Lean methods, tools, and behaviors. The members inside the community of practice held regular sessions dedicated to learning and sharing best practices.

¹⁴ The only exception was Southwest Fire. They were a relatively small company and therefore could not have dedicated personnel involved in the community of practice.



Figure 18: Core Team and Community of Practices Roles

The roles of the cluster leaders and cluster members are summarized in figure 18. The cluster leader's main responsibilities are: (1) use pull planning to organize the work within the clusters, (2) ensure that commitments are being met, (3) verify to constraints within the clusters are removed, (4) ensure that the key topics/concerns of the clusters are included in the agenda of the integrated team meeting, (5) represent the cluster in the integrated meetings, (6) be involved in the on-boarding process, and (7) promote the use of Lean Construction methods, principles, and tools.

The members work with the cluster leaders on: (1) developing the pull plan, (2) ensuring that commitments are being met, (3) removing constraints, (4) developing the A3s for problem solving and decision-making, and (5) continuously learning and applying.

The integrated governance model ensures that the responsibility of work is distributed across the team members. For example, the cluster leaders are responsible for the onboarding process. This governance structure avoids bottlenecks in the decision-making process and gives more control to the people doing the work at the cluster level.



Figure 19: Cluster Leaders and Cluster Member's Responsibilities

4.3.3 Joint Responsibility and Transparency

As described earlier, the responsibility for the project was distributed amongst the members of the team via the cluster groups. Since the risk and reward was shared between the members, it makes sense that each of the partners had an "oar" to steer the ship. Joint responsibility and shared governance was very important in promoting a team environment. The organization of the team is centered on delivering the best possible results for the project. Figure 20 shows the members of this integrated team.



Figure 20: Integrated Team

Transparency was a key principle that was actively promoted on this project. All of the TVD/IPD team members had the right to audit each other's finances. The labor productivity and production rates were tracked and publicly displayed on-site (Figure 21). By displaying project Key Performance Indicators (KPIs) in accessible locations (e.g., in the trailer and on the job site), the people who needed the information could access it quickly. The practice of making the workplace "visual" reduced the number of times that people needed to ask for the information, which can be a time-consuming and expensive process. Miscommunication and miscoordination of information can be reduced by this practice.



Figure 21: Field Board at Temecula (Seed, 2014)

4.3.4 Co-location and Big Room Meetings

During the early stages of the project, the team developed several temporary big rooms. Overall the team shuffled between 3 big rooms before establishing a permanent space on-site. During the schematic design phase, the team had "big room" (aka integrated team) meeting every 2 weeks. These meetings occurred off-site at another project site in Corona, California. During the design development and construction document phase, the team had big room meetings twice a week on Tuesday and Wednesday at the Corona site. At the start of construction, the team was continuously co-located on-site and held formal "big room" meetings twice a week. Figure 22 and Figure 23 show the layout of the co-location at Temecula Valley.



Figure 22: Co-location Space (Temecula Valley)

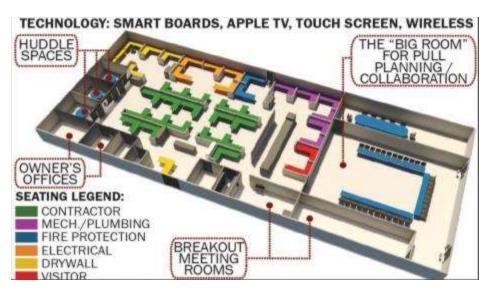


Figure 23: Co-location Trailer Layout (Temecula Valley)

In order to maximize the efficiency of the big room meeting, the TVD/IPD established several ground rules:

- This is a Safe Zone
- **Everyone is encouraged to speak his or her mind** without concern for embarrassment or ridicule by others.
- We all have equal status and say in all matters.
- No one person has more authority than others.
- **Speak up** get engaged in conversation and share ideas.
- Your opinion is important in helping guide the team.
- Listen to others focusing on what others have to say helps you understand their point of view.
- No side conversations.
- Only have one meeting at a time. Conversations should be heard and shared by all.
- Help keep the meeting and participants on track by eliminating phone disruptions.
- No multi-tasking. This includes laptop computers and PDA's.
- Stay on time. This includes start time, end time, break times and agenda

Figure 24 shows the layout of the team's scheduling software for the big room meetings. Some key components include: (1) big room facilitator, (2) color codes for breakout sessions within clusters, (3) timing of the meetings, (4) expected outcomes of the meeting, (5) attendees, and (6) contact information.

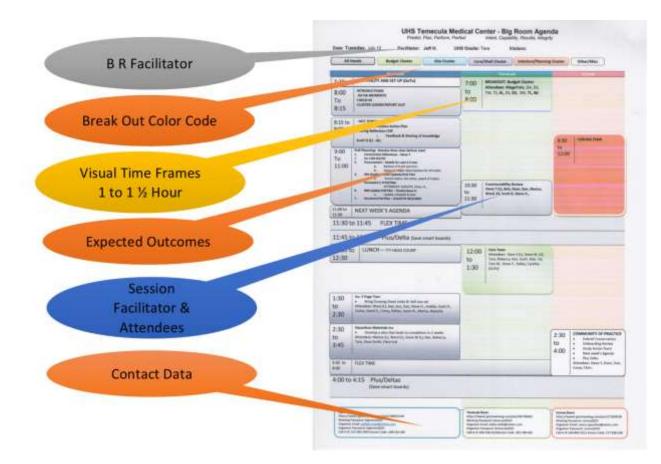


Figure 24: Big Room Meeting Scheduling Software

During DD and CD, the team held big room meetings on Tuesdays and Wednesdays. Tuesday's meeting was with the cluster group and breakout group. Wednesday's meeting was for the whole team. On Wednesdays, they would talk about their numbers (cost, schedule, and burn down rates), conduct pull planning, and identify lessons learned. During construction, they had 1 big room meeting per week for the key trades. The management team met 1 hour each week to go over elevated issues. Towards the end of the project the meetings got shorter and the cluster group was no longer needed during construction. Although the contents of the big room meetings varied through out the project's timeline, the team developed a structured approach for the meetings, which included (Figure 25):

- 1. Introduction / Ice Breaking to get people comfortable with each other and breakdown barriers.
- 2. **AH Ha Moments** something that happened that surprise you or something that came to you.
- 3. **Budget Reporting** burn rate, status of the overall budget, review of saving items, review of risk items.
- 4. **Hot Topics** items that came up from the daily check-ins, which needs to be addressed quickly in order to maintain schedule or budget constraints.
- 5. **Pull Planning** sometimes there would be multiple pull plans being done in the same day with different cluster groups.
- 6. Community of Practice / Time Reserve for Learning they would invite someone outside to come in to present to the group. This person could be a vendor or person knowledgeable about a topic. Additionally they would send two people from the project to visit another job and presented what they learned. Sometimes, they would have people within the group present their lean practices or innovations.
- 7. Break out groups (rest of the day).

8. **Plus/Deltas** – the plus deltas were conducted in the morning (before lunch) and in the afternoon (at the end of the day).

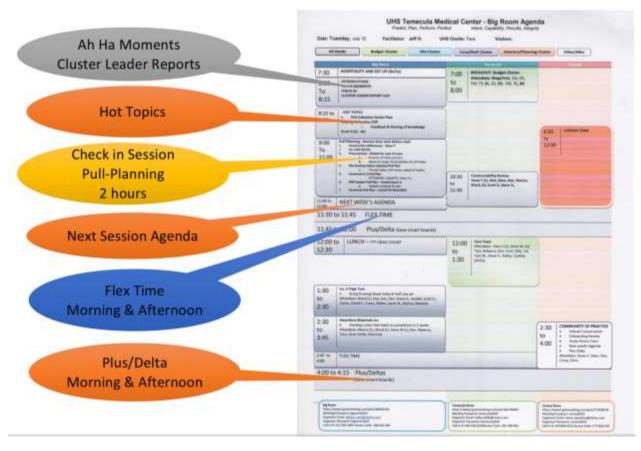


Figure 25: Big Room Meeting Agenda

In addition to the big room meetings, they also had daily check-in call (~15 minute) with the construction crew. It was created so that if a constraint came up, they can quickly remove them. The daily check-in call was well scripted so that people were not getting bogged down. At that meeting they would go through the following items:

- 1. Report whether or not they were on track.
- 2. Identifying constraints
- 3. Determine who is the primary contributor to that constraint.
- 4. Gather commitments
- 5. **Develop follow-up actions** items that could be resolved within the cluster group were done within the group. Items that required cross-group problem solving were reported to the integrated team at the big room meetings.

According to the team, co-location, big room meetings, and the daily check-in calls led to:

- More accurate documents
- Early constructor inputs in the design
- Labor savings ideas incorporated into the design
- A higher rate of information flow (no RFIs)
- Better cost decisions and cost control
- Tighter tolerances

- Designing and installing the right sized systems
- More innovation

4.3.5 Collaborative Design Conversation

The team used a collaborative process where the designers took inputs from the trades and engineers to develop the design together (Figure 26). These collaborative design sessions included between 10 and 15 members in the same room. The designer(s) would propose several alternative design solutions and the rest team would give feedback, add information, and help evaluate the design. Using Smartboards, the information is documented electronically, which allows the team to revisit their work in the future.



Figure 26: Collaborative Design Conversation

Figure 27 shows a set of alternatives that were considered for the corridor design. The options include: (1) Double 40 Gen 2, (2) Double 40 Compact, (3) Double-Loaded 40, and (4) Traditional 40. Following the CBA methodology, objective data about the sets of alternatives were first collected and then the team decided between the alternatives based on the advantages each offered. The design decisions were locked in at the Last Responsible Moment, which is the point in time when failing to decide results in losing one or more of the options (Ballard and Howell, 2003). According to the architect (Mr. Wilson), the goal of set-based design is to lock in decisions at the appropriate time. Set-based design and the Last Planner allowed the team to select a building system and stick with it knowing that any changes after the Last Responsible Moment would lead to costly redesign and additional permitting problems with OSHPD. During the construction document stage, the design team was solely focused on detailing the design for shop fabrication and did not try to re-optimize the initial design.

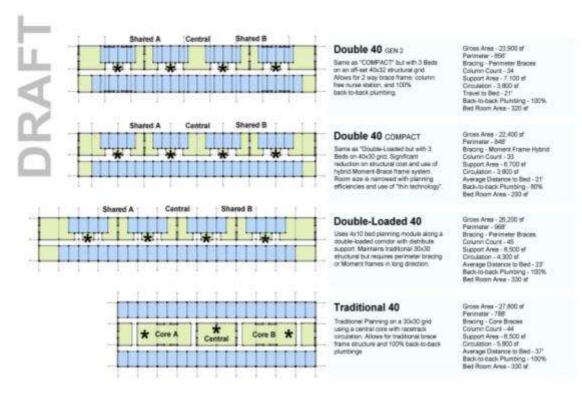


Figure 27: Sets of Corridor Design Alternatives

4.3.6 Simulation of Operations

After the development of the Target Cost and the initial target program, the architects met with the users to understand their needs. The goal is to make sure that there is an alignment between the initial program and the needs of the users. Once an alignment was established between the Target Cost, target program, and the needs of the users (Figure 28), the architect began the programming phase where they and a team of industrial engineers simulated the workflow and throughput based on the intended operations of the facilities. For example, the program may require a certain number of operating rooms and one of the tasks for the team is to simulate the average wait time, walking time, and overall capacity. The data from the simulation was used to inform the schematic design and detailed design.

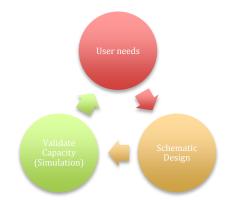
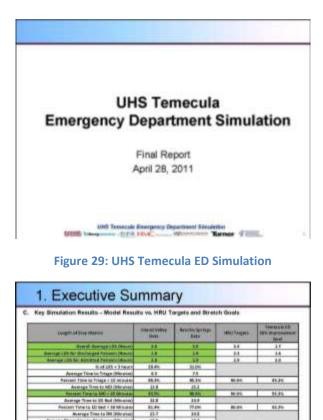


Figure 28: The Role of Simulation in TVD

Figure 29 through Figure 34 show an example of a simulation conducted on the Emergency Department. In this example, the design team used the initial floor layout to develop a value stream map of the intended service. They then translated the value stream map into a discrete event simulation. After

inputting assumptions for the activity durations, arrival rates, batch sizes, etc. they were able to calculate the capacity of the Emergency Department, average wait time, and resource utilization. The simulation model for the Emergency Department allowed the team to validate whether or not the needs of the users can be met with the design. In some cases, the design team used the simulation to inform the development of design alternatives. They then used Choosing By Advantages to select the alternative that offered the greatest advantages while meeting the 'must-have' requirements. See appendix 6.2 for some examples of this process.



,	Average Disposition to Diskings (Minutes) screet Disposition to Diskings (15 Minutes)			8.05	46.25
1	Names interaction to interact and		eternet pressed	ne la stra se	
5	The "Term to MD" is well of encounts the 195/1			1	
ε.	implementing a FDG trage mature but could indice supplication (WU toget) are strived.		STD MUR INCOMES	the Treats Trape	#472# 840 B
		tes have been ru			

- Tarner 4

Figure 30: Executive Summary

UNS Tenercule Energency Department Sile

APORT IN

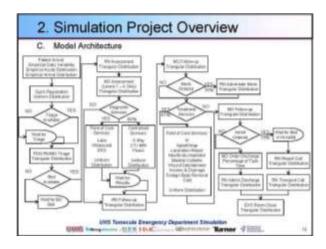
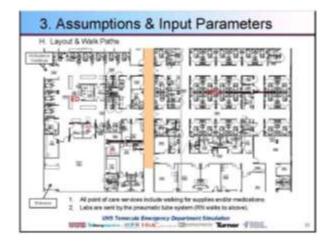


Figure 31: Simulation Overview





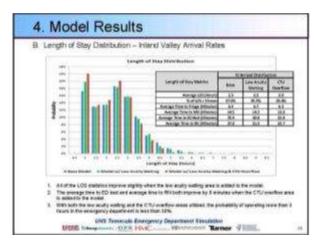


Figure 33: Simulation Model Results



Figure 34: Value Stream Mapping of Kitchen Operations

4.3.7 Building Information Modeling

The team started using BIM early in the schematic design phase. According to the team (see Lessons Learned Report) they on-boarded the BIM modelers too early in the design process.

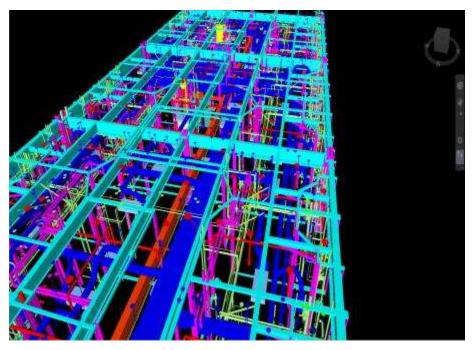


Figure 35: Temecula Valley BIM Model

The BIM coordination allowed the team to reap substantial savings because they could reduce their tolerance and prefabricate some of the construction off-site. The exterior wall and the roof trusses were prefabricated in major panels and erected on-site. The team went as far as brainstorming ideas to prefabricate bathrooms off-site, which ultimately did not happen.



Figure 36: Prefabricated Exterior Walls



Figure 37: Prefabricated Roof Truss

At the time of the Temecula Valley project in 2010, BIM technology was not advanced enough for the team to use a single model. The team used mainly Autodesk 3-D for model coordination and exported the model dimensions into specific software packages for CNC and shop fabrications. The team did not use Revit because it did not have the information and data compatibility capabilities that it currently has. The team only used BIM for model-based quantity takeoffs on a select number of scope (ducts, piping, and framing; Figure 38; Figure 39). In the design phase, the cost estimates were forecasted based on the alternatives in the set-based design process using on-screen takeoffs. Future projects may look at using

BIM for automatic quantity takeoffs to aid in the TVD process. During the construction phase, the cost estimates were forecasted based on labor productivity rates, general conditions, and market prices of materials that had not yet been bought out.

The TVD/IPD provided more transparency in the BIM process. The team found that:

- "We (and the industry) are over-modeling"
- The BIM process is approximately 30% to 40% too costly
- BIM Leadership is young and inexperience
- Models are created for differing purposes
- The main trades that can benefit from BIM are the ducts, piping, and framing.
- BIM works best when the key players are co-located
- BIM requires a process plan
 - Understand the needs/uses
 - Understand the dependencies
 - Understand what is generating cost
 - Modularize the model
- Mechanical, plumbing, and framing needs to share leadership for BIM coordination
- BIM can make costs more predictable

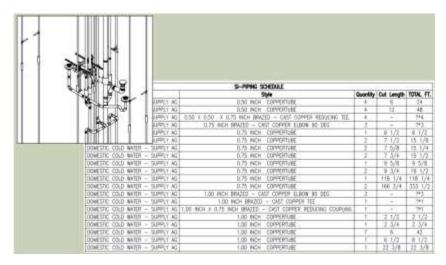


Figure 38: BIM for Piping Coordination and Quantity Take-offs

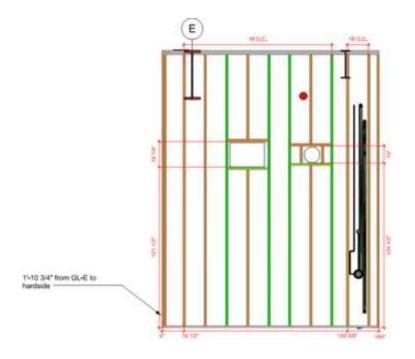


Figure 39: Framing Layout and Spool Sheets from BIM Model

4.3.8 Last Planner® System of Production Control For Design

The team used the Last Planner® in both the design and construction phase. The collaborative pull scheduling and commitment planning of the Last Planner® was brainstormed with sticky notes and then recorded and tracked using OurPlan[™] (Figure 40; Figure 55; Figure 56). The Last Planner® System of Production Control breaks the project schedule into: a master schedule, phase schedules, lookahead schedules, and weekly work plans (Ballard, 2000). The schedule is developed in greater detail as it approaches the work. The Percent Plan Complete (PPC) measures the percentage of work that was completed vs. the amount of work that was planned for a particular day. This metric encourages reflection and learning from breakdowns (Ballard, 2000). On the Temecula Valley project, the PPC clustered around 80% (Figure 57). The team revised their master schedule every 3 weeks, their phase schedule every week, and their weekly work plan on a daily basis.



Figure 40: Pull Planning Session

4.3.9 Set-Based Design

The process during schematic design and design development followed the progression of developing: (1) the systems, (2) the assembly, (3) subsystems, (4) components, and (5) the details and finishes. The team used Set-Based Design, also known as Set-Based Concurrent Engineering, which was originally developed by Toyota (Sobek et al., 1999). Under the Set-Based Design approach, the team generates alternatives and chooses between them at the "last responsible moment" (Parrish, 2009; Figure 41). An acceptable alternative is developed early in the design process as insurance against 'the first irresponsible moment'; i.e., extending the project schedule. The alternatives are reviewed by a cross-disciplinary team using Choosing by Advantages to ensure that stakeholder values are met (Arroyo, 2014).

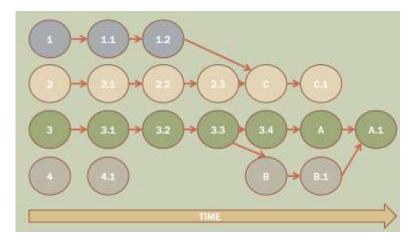


Figure 41: Set-Based Design

4.3.10 A3 Reports

The design team documented all major design alternatives using A3s (Figure 42). The A3 document is a single sheet of paper that was used at Toyota to in a systematic problem solving process (Shook, 2009). At Temecula Valley, the A3 document included sections for: (1) The issue, (2) Background, (3) Current condition / problem analysis, (4) Target condition, (5) Analysis, (6) Proposed countermeasures, and (7) Follow-up. Figures 42 and 43 show two examples of A3s that were used to document design alternatives. Within the A3s, the advantages of each of the alternatives are listed and used to aid the decision-making process. The team used A3s to document all major decisions including: (1) building system selection, (2) selection of team members, (3) component selections, and (4) material selections. New members who joined the project could look through a binder of A3s to quickly get up to speed on the major decisions and understand the history of the project. Likewise, the A3s documentation process reduced the loss of institutional knowledge when an individual left the project.

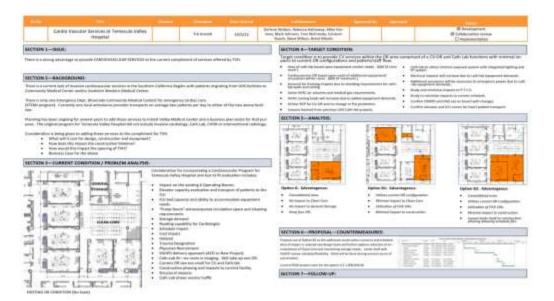


Figure 42: Temecula Valley A3 (Cardio Vascular Services)

62.W	Research of Delpad	e.	Tacillaria (URLOSS)	Art Wright, Mills Lover, Maw Wilco, Art Pitts, Tans Laski, Behavior Hochsony, Some Yee, Tom McCrosely, McDrock, Soil (CD)	20 Q	Mitweetysmeet Dischalgeretherspress O regeleration
Inclus 1 - Radyroom	hard the second second	Dentes 4 - Analysis		hereiten einen staden etter sonere		
sear of the hospital. J	acceled a metallation to the status mod Superche DS to evolv adultate of	 The first devider facing the least invition with the required. Even accessed light, Joyne, means mini- tion accessed devideon involves, in May make the observation required balances to the team approach isother, for the team approach. 	In service to be whether there is any up if we below the hetped where it was ab- periative to decige a material table bedre methor to decige a material table bedre methor of a committee table to obtain is same possible that the day advance is same possible that the day advance where, the decige sets is proceeding	And the world having to removed the UK, happening a public over, the theory-analysis leads in Section 2 201 must be made the location mean legitor in invincing parameters of analysis public or a Fully primiting happening on the section in the analysis of the section of the section in the section of the section of the section of the section of the section of the section of the section in the section of the section of the section of the section of the section of the section of the section of	evening process. When excepting the basis, is need before we will get the recorrect California a ky exightering residences. Sectored the design beam would be writing a bits their events these record theorem. The	era/VAA, parents. The reconstruction for a to proceed with the decays of an UAS one is it delition, an UAS of a world manafer approval it
Beillun 2 - Frakism Ba	inmant/Current State		1.00			1
scenares, have been die trik. 1. The heritaal laws des Abeliaal Services (Jr), o Igliding, markelige, o jetr Galbars Dooder deer address obtain her Galbars (door is	uning dampanists and monitor in the toposoint graphic as in "Transposo G Londrag Edwards", Taxonom on the name participan of the name participan of the management theory Satesan, participant (theory Satesan), participant (theory Satesan)		р-1-1 Д-9-1-1			
 The EA shows a size. This will not mean fa second Fight piets. I reconvenant/their po restares. 	ole permanente antes		State Designment und	ALL INCOMESSION IN THE REAL PROPERTY OF THE REAL PR	INT A MORE	A NAME OF A DESCRIPTION
	S shown in the Diluthes shuther traine study. This is	OPAPROCEDON COST	8183	18		80)
anality selous ma	spector,	INFOCT OF ADDRESS	Significant - Flight path over apro: the rights, haird	all then servers a from in HOA opported after own weightion's bacture's	tool: Plate petr - Minimal- English publics	primarila one commercial usas
adjacent spanners	when the fight path. Take	DI MATRIS, FRUIR DESIGNAL CIN & MAQUE MED	Minimum Palipad in original location parts to be aboved.	Downlight Million and - Loorthon and fog 2 paths also	ereit	ord Togic patrix allowed.
	to the base of the second second second	CONTRACTOR DAMAGEN	Significant - Large Intering web (10)	whet Helped placebook sche 427	nteni, ruhiwenen; Arianna'- Hedped coor anafra	d be nounded to N. Nonstaring
Lesion 1 - Turine Dave	illui	NEWS TO OTAKE MALLED	stere.	Minister - Parting around Press content redesign arises Pellpart intention in Non	WORKING HILLS	Praise In significantly, repartial, only to accommodate Hallpail
		DESIGNAL BARACY	(Heistoweigh)H	UHR bookign III	DAX to weigh in	
reight-oring ranks	maintage for calculately for	Jan Key J - Proposal				
tevice/drotoping	ant olympias	Serbist 4 - failure up				
unstruction when	NR	Anton States M				

Figure 43:Temecula Valley A3 (Location of Hospital)

The Temecula team also documented all of their monthly updates using A3s. The A3s includes the key performance metrics (e.g., budget, schedule, safety) and lessons learned (Figure 44).



Figure 44: December 2012 Report

4.3.11 Value Engineering

Dell'Isola (1982) states, "the optimum time to conduct a value review is after the preliminary submittal stage and before working drawings are started"; however, most construction projects perform VE after a substantial portion of the design has already been completed. Due to the reactive nature of VE and the use of the practice to cut costs (often with compromises to scope and quality), the term VE has a bad connotation in the construction industry.

One owner representative on Temecula Valley said: "We had a very specific business model. We do not need the fancy glamorous hotel, we just needed a facility that was fit for our needs." The process of evaluating the design based on its functional value and optimizing it to fit the user's need is a core practice of TVD. The participants on Temecula Valley reported in our interviews that they did not use "Value Engineering". While true that they did not do VE after design was nominally complete, but needed to be brought into budget, the basic concept of value engineering was used, but proactively in generating the design, not after-the-fact. Their practice of 'VE' followed the disciplined approach of Setbased Design and relied on Choosing By Advantages and A3 reports for decision-making and documentation (Appendix 6.2).

4.3.12 Cost Modeling and Cost Tracking

The project team used a centralized spreadsheet to track all of their costs, uncertainties (risk and opportunity), and monthly billables. As the project progressed, cost items gradually became locked into place through the Set-based Design process. At the Last Responsible Moment, certain decisions were made and the cost associated with them became fixed. Decisions not yet made were assigned "rough order of magnitude" (ROM) estimates. The current cost estimate shown in Figure 45 is the sum of the cost that has been fixed and the remaining ROM items.

At any point in time, there were cost items that were locked in place because the design had already been committed or the work was already finished. Any attempts at changing the cost items that were already locked in would result in greater cost due to negative iterations, rework, and delays. The remainder of the cost items is still malleable. The malleable cost items have associated uncertainties with them that reflect either a risk or an opportunity. The TVD/IPD team tracked these cost items very carefully and set targets to reduce waste in the remaining work (Figure 45). These targets created a pathway for the team to realize their full profits at the end of the project. Figure 45 shows the cost spreadsheet on February 2012. At this time in the project, the team needs to reduce \$2.5 million from the project cost in order to realize 100% of their negotiated profits. The TVD/IPD had \$84.2 million that has not yet been spent.

A		. c	0			6		4		
Team Member	PICE	PTCE	Feb-12 Bodget	Monthly	Transfer Ter	Transfer	Deuriptics	fab-12 Hilling	Tutal	% Complet
Joint Venture (N)	54,874,842	34,674,647	24,841,765	TRAFF	/90	11949		0	12 615 417	2215
Second Advanced Division	Sector Cond	and an entry	100000	80.800		10	OliCalege	_	and the second second	
		_	_	-1591.000	HC .	Tanta	The menal (Thill with mean in Campailly)	to baried		
				Same of	A COLUMN TWO IS NOT	The set of the	Statute in the second state of the second states of the			-
Archanical & Plumbing (MP)	Contraction of the	24,825,454		-215,115		aret			4,353,254	1.0%
and the second se	10110-014	2004230454	PL395.135	-40,000	N		Officience	-		1004
				23,889	A COLUMN TWO IS NOT	90	Add clock diable a partnerse			
				101.80	- CC -	Children II	Shikiptonipodation adarment		-	
	-		1		- Unar	igned .			_	
(Rectrical (F)	12,751,700	\$1,751,700	14,448,634	696,934				9	5,545,964	21%
				11,210		00	CE-College Rote: Factoring to California			
				-504.540	10		Partners (Bobers			
				4		igrad.				
Drywealt & Feaming (DF)	8,015,506	8.031,966	8,555,949	\$17,961					734,823	P4
				47,088		- 26	To all of the balance to hardware			
	1			73,942	1000	30	CTIERT Due al Calego per COVEC			
				-8258	50	and a	CTURTEL school is the Plantid Planty			
Fire Protection (FP)	1,231,723	1,211,721	1,285,707	17.504					295,243	22%
and the second second second	10000101	60110711	ALC: NO.	-9.759	14		Freinaging			
				84,385	and the second	20	Address of the and second salar course .			-
		1		-8.175	- CC -	1000	Freetigung budget anna lose			
				1	- Unar	righted .			_	
Architecture (AR)	7,744,839	7,744,839	7,496,485	-248,345					5,796,041	77%
	_			-22,000	in:		Table considers			_
						ACCR NO.	The same			
the second state of the state of				4	. Uhan	igned				
Owmer Hisk Hanns (1941)	9.0944.082	\$.0%4.06E	9,862,945	764,897						
			100000000000000000000000000000000000000	-36,349	M		Address Happening story			
				90,000	1000	00	Address of partner ty to the lage			
					1.00	gred			_	
senser Next Risk Rents (UNI)	24.001.552	24.462.512	34,661,552	0		10.01				
and the second second second	1000000000	Contraction of the								
Design Contingency (DC)	1.503.000	1,500,000	151.501	448,500	_	-			_	
the statement was a lost		and the second second					Name of Astron Sudge of State			
natruction Contingency (CC)	2,850,516	2,855,528	2.150.141	-700,175						
the state of the s				-1827			Parries scener upolitical scene			
Peolit (P)	1.881.551	1.661.551	1.495.043	-019-0.508						
Todal	151.044.000	150,044,000	150,044,000							

Figure 45: Budget and Billing Tracking

The Path Back					
We must work towards	2,541,047	in Project Savings, in order t	o recognize 100% of ou	r planned Pro	ject Profit.
Here's how we get there					
Item			Value	Date	
JV Escalation Contingency Red	duction		325,000	02/01/12	
JV Buy out of commodity trad	les		300,000	04/01/12	
MP to target 3.5% general co	nditions pers	onnel cost reduction	77,913	04/01/12	
MP to reduce copper costs by	4%		50,000	05/01/12	
MP to reduce major subcontr	acts by 3%		32,989	05/01/12	
MP to target 4% plumbing fie	ld labor prod	uctivity gains	167,887	08/01/12	
DF to target \$98,000 in drywa			98,000	08/01/12	
DF to target \$89,000 in framin			89,000	08/01/12	
A to target \$75,000 reduction	in reimbursa	ble costs	75,000	08/01/12	
E to target 5% in material buy	outs		150,000	09/01/12	
E to target 4% general condit	ions cost redu	uction	45,000	09/01/12	
E to target 3.5% in commodit	y material co	st savings	65,000	09/01/12	
JV Productivity and Innovatio	Cost and and a local strend of a started and a strend to the started as		250,000	09/01/12	
JV Savings in Cost to Complet	e		570,556	01/01/13	
E to target 6% in labor produc	ctivity gains		71,000	03/01/13	
Subtotal			2,367,345		
Additional Reduction in DC ar	nd/or CC requ	ired	173,702		
Total			2,541,047		
Total Project Contingencies h	eld are		3,164,133		
Total Project Contingencies c	an cover Pro	ject Profit Shortfall			
	d Prorated fo	or Each Team Member	Left to Spend	Target Savings	Target Savings as %
Joint Venture (JV)			42,213,328	1,273,715	
Mechanical & Plumbing (MP)			20,045,065	604,826	
Electrical (E)			11,402,670	344,056	
Drywall & Framing (DF)			7,829,128	236,231	
Fire Protection (FP)			994,464	30,006	
Architecture (AR)			1,730,444	52,213	
Total			84,215,099	2,541,047	3.02%

Figure 46: Cost Tracking

4.3.13 Risk Identification and Risk Management

The team tracked all potential known risks and opportunities on an Excel marker log. They then assigned a rough order of magnitude (ROM) estimate to each risk or opportunity's potential impact on the project. The shared pains and gains meant that the team had to trust each other. Within in this trust; however, is also the permission to challenge and question other members of the team. Since everyone's best interest is aligned with the interest of the project, the challenges are not construed as personal or professional doubt but rather as a way to ensure that the actions taken are best for the project.

					And other to Happen Person			
De	ter	min	A RI	sk 2 ways	-	inter .	ALC: NO	-
00			0 111	on a mayo	A france and only of the product students	11,10	626	
					R free an instance (1) day is second of tensor	100,000		
	2.1.00	+ mm	Know	vn Risk	B Sector Control to control and	1.00		
	Juri	ent	nnov	VI RISK	W have distribute	5.00		
					Particular and an exception of the Party of			
		and the second		Philadel and the second second	April 1	-	- 20	- 2
	AIL F	oter	ntial	Risk on Hospital	- Instatus	10.000		
				thon on moopreen	10.8L	100,000		
					to be a set of the set	27,00		
Tree	1000	and	nha	re all risk				
• 111	151	anu	5110	ire all risk	and the second s	1.000.000		
					Name for investmenting them	100.000		
	122				Party of the local day			
Ch	211	ond	0 0 0	ch team membe	ge lower lowlooks lookages	144.00		
- 011	an	Cing	c ca	ch team membe	Address of the second			
		-	-					_
		-	-	Haruti 1, 2013 consider lowene			-	_
			-	March 1, 2013 catalities toleane 100-P2 Tell util deensitions that teach in charges to	sprond therings and bdays. Possible Newcor	Num 11-		_
2180212				March 1, 2013 consider toleane CG-P2 Reli staff steen allow that tesuit in charges to	sprond therings and bdays. Possible Newcor	Price 11		
2180212				Nerth C. 2013 consider intense DG-V3: hell staff alexensions that basis in charges to repart of \$100k to 1.00. Protectly of \$5% for enal to Near C. 2018 consider reference	approval theorype and delays. Principle Neurosci day relies taking to Th. to higher miller relies.	Print 111		
2180212 8210213	77		April 1	March C. 2010 consider twissee DG-PD2 fact staff charmations find read to charges to space of 5 USES to 1.50. Proceeding of 80% for events May 1, 2010 consider reveals DD-PD2 fact and consider reveals DD-PD2 fact and consider reveals	approval disarings and Joleys. Provides Prances the relies relating to TS, for higher states relies.	Star (1)		
eans.	77		April 1	Marcin 1, 2013 estimates interests DSPRS fast and statements and read to sharing as to separat of 2015 to 1, 300. Proceeding of 2015 for secal and Marg 1, 2015 container reference DSPRS (a.2.10) container reference	approval disarings and Joleys. Provides Prances the relies relating to TS, for higher states relies.	Mage 11		
8210010	77		April 1	March V. 2010 extended retrained 2019-70: Set of an annu for a final in charges to regard of VIDE V1. 300. Protected of Set and in May 1. 2010 extended retrained Dis-VID fact aged determines that leads in charges to Magnet AL 2010 extended retrained August AL 2010 extended retrained Augus	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite	Mage 11		
8210048	77	-	Agens Agens	March V. 2010 consistent retrained COVPC but inderivations of the local do characteria regard of 2020s by 1.202. Probability of 2016 for event May 4: 2017 consistent retrained Derived for an anti-characteria for derived in charapter to research (2020s 1). 1.1.9. Producting of 2015 for event manual (2020s 1). 1.1.9. Producting of 2015 for event degrees 7, 2010s for another indexes CoVPC Data and indexectations that security in charges to appear of 1016 for a 1.1.9.	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite			
8212012 8082012 8082012	77		Agenta Agenta Agenta	March 1, 2010 extended retrained COVPD for control extension and the local in characteristic register of 1000k (s. 1, 50). Propagato to the send to May 1, 2010 extension retrained COVPD for control extension retrained COVPD for control extension retrained August of 1000k (s. 1, 10). Probability of 2010 key extension August of 1000k (s. 1, 10). Probability of 2010 key extension and automatical discoverations that small as charapped to major of 1000k (s. 1, 2010). Probability of 2010 key extension and 1000k (s. 1, 2010). Probability of 2010 key extension major of 1000k (s. 1, 2010). Probability of 2010 key extension and 1000k (s. 1, 2010). Probability of 2010 key extension and 1000k (s. 1, 2010). Probability of 2010 key extension	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite			
8213213 8083018 8083018 2180018	77	-	Agens Agens	March 1, 2010 extended torbuste COVID Entry Counterparts to relation of trapping of 1000x to 1.180. Protecting of 2010x for another trapping of 1000x to 1.180. Protecting of 2010x for another Dorsell of 1000x 1.180. Protecting of 2010x for event to Regard of 1000x 1.180. Protecting of 2010x for event Regard of 1000x 0.180. Protecting of 2010x for event Regard of 1000x 0.180. Protecting of 2010x for event to Protecting of the 1.180. Protecting Protecting of the 1.180. Protecting	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite			
8212018 8082018 8082018 2190018 8280018 8280018	77	ant A A Donal	Agens Agens Agens December Drock	March V. 2010 extended retransfer COVPD for conditionershifts of a load in charges to regard of VIDE V1. 58. Projection of the load in charges by 1. 2010 extended retransfer COVPD for conditionershifts for the load in charges to regard of VIDE V1. 1.10. Projection of the load in charges to regard of VIDE V1. 1.10. Projection of the load in charges to regard of VIDE v1.10. Projection of the load in charges to regard of VIDE v1.10. Projection of the load in charges to regard of VIDE v1.10. Projection of the load in charges to regard of VIDE v1.10. Projection of the load in charges to regard of VIDE v1.10. Projection of the load in charges to regard of VIDE v1.10. Projection of the load in the VIDE interpolation on the	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite			
8213213 8083018 8083018 2180018	77	-	Agenta Agenta Agenta	March 1, 2010 extended internation COVPO Extra conditioner extension for the feasibility of processing and an USA to 1,300. Providential of 2016, for event an Way 1, 2016 extended or relevance COVPO Feasibility of the condition and reach or changes to COVPO Feasibility of the condition of the feasibility of the August of COVPO feasibility of the condition August of COVPO feasibility of the condition and the conditioner extension feasibility of the August of COVPO feasibility of the condition and the conditioner extension feasibility of the Peak Independence on the Peak Independence condition ADM Independence USA.	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite			
8210013 8000013 8000013 8000013 8000013 8000013 8000013 8000013	77 100 100 100 100	atil Ji Ji Ji Ji Ji Ji Ji Ji Ji Ji Ji Ji Ji	Againa Again Again Againa Againa Againa Againa Agai	March V. 2010 extended retranse COVPD for inclusion stress of a load in charges to regard of VIDE Vs. 1989. Projection of the load in March 2010 extended retranse Dovert face coeff descendences that lead in charges to Append in VIDE Vs. 1989. Projection of the load in Append VS. 2010 extended retranse Dovert face coeff descendences for lead in charges to Append VS. 1990. Projection of the load in the load Append VS. 1990. Projection of the load in the Append VS. 1990. Projection of the Append VS. 1990. Projection of the Appendix of the load intervention of the Appendix of the load in the load in the load in the Appendix of the load intervention of the load intervention of the Appendix of the load intervention of the Appendix of the load interventi	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite			
8212018 8082018 8082018 2190018 8280018 8280018	77 100 100 100 100	ant A A Donal	Agens Agens Agens December Drock	March 1, 2010 executive retranse COVPO Exer conditionersections for the feed of characterizations register and 11/05 to 1, 100. Providentity of 2015, for event an March 1, 2015 to 1, 100. Providentity of 2015 for event an Angels of Euler 2015, 11/06. Providentity of 2015 for event an Angels of Euler 2015, 11/06. Providentity of 2015 for event an Angels of Euler 2016, 11/06. Providentity of 2015 for event an Angels of Euler 2016, 11/06. Providentity of 2015 for event an Provident of Euler 2016, 11/06. Providentity of 2016 for event an Provident of Euler 2016, 10/06. Providentity of 2016 for event an Provident of Euler 2016, 10/06. EULER 2016, 10/06. EULER 2016, 10/06. EULER 2016, 10/06. E	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite			
521(251) 830(351) 830(351) 830(351) 830(351) 830(351) 820(351) 820(351) 830(351)	77 100 100 100 100	an Ji Ji Diyest Beng	Agenty Agenty Agenty Agenty December Option Option Option	March V. 2010 extended retrained COVPO. Net contractmentories on tal sead in characteristics regard of VIDE Vs. 1.58. Projectional of Sead in May 1. 2010 extended retrained COVPO. Net contracteristics field lead in charapter to Append in VIDE Vs. 1.58. Projection of Status 1.5. Charapter to Append Vs. 1.50 Contracteristics and the sead of Append Vs. 1.50 Contracteristics of XID is not open Append of 1.00 k vs. 1.58. Projectional of XID is not open in regulation Vs. 1.50 Contracteristics Market and the sector open Append Vs. 1.50 Contracteristics Market and the sector open in regulation Vs. 1.50 Contracteristics Market and the sector open XID is a recently for track of markets Market append Vs. 1.50 Contracteristics VS. 4 accentific Append Status 1.50 Contracteristics VS. 4 accentific Append Status 2017	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite			
8210013 8000013 8000013 2190013 8000013 8000013 8000013 8000013 8190013	77 100 100 100 100	atil Ji Ji Ji Ji Ji Ji Ji Ji Ji Ji Ji Ji Ji	Againa Again Again Againa Againa Againa Againa Agai	March 1, 2010 execution retrained COVPO2 best contractions retrained ingradient of 1005k to 1,300. Providentity of 2015k for event on March 1,2015k execution retrained COVPO2 for execution retrained August of 2015k to 1,300. Providentity of 2015k for events Marganet A, 2015 contractions that small be changed to marked of 2015k to 1,300. Providentity of 2015k for events Marganet A, 2015 contractions that Marganet Amarganet Marganet Marganet Amarganet Marganet Marganet Amarganet Marganet A 2016 contractions contractions values 2016 contractions that Marganet Amarganet Marganet Marganet Marganet 2016 contractions contractions values and that Marganet Amarganet Marganet Marganet Marganet Marganet Marganet 2016 contractions contractions values and that Marganet Amarganet Marganet Marganet Marganet Marganet Marganet Marganet Amarganet Marganet M	Approved stratings and adapts. Possidie Neurosi die veloe samp to Dis for higher make veloe. Approved interrupt with lenses. Possidie Neurosi die deles rearrigs bits for "adapt reference". Approved theorings and deays. Possidie Neurosite			
8210013 8000013 8000013 8000013 8000013 8000013 8000013 8100013 8100013 8100013	77 100 100 100 100	an Ji Ji Diyest Beng	Agens Agens Agens Agens Distantion Distantion Distantion Distantion Distantion Distantion Distantion	Marcicle 10, 2010 extended intervance (Col-PD) fails of another intervance (Col-PD) fails of another intervance (Col-PD) fails (Col-PD) fails (Col-PD) fails (Col-PD) fails (Col-PD) (ColPD)	Approved stratings and adapts. Possible Neurosci Bir relies samp to Dis for higher relies value. Approved interrupt and leaves. Possible Neurosci Ris relies relevang and leaves. Possible Neurosci Approved theorings and deays. Possible Neurosci			
8210013 8000013 8000013 2190013 8000013 8000013 8000013 8000013 8190013	77 100 100 100 100	an Ji Ji Diyest Beng	Agens Agens Agens Agens Distantion Distantion Distantion Distantion Distantion Distantion Distantion	March 1, 2010 extended release Color 2, best color advances (color advance) region of 1005 to 1, 500. Proteination of 2010 to 1000 per target of 1005 to 1, 500. Proteination (color advance) Color 20 face and coloradores that sould be changed to August of 2006 to 1, 100. Proteination (color advance) August of 2006 to 1, 100. Proteination (color advance) August of 2006 to 1, 100. Proteination (color advance) maxes of 2006 to 1, 100. Proteination (color advance) Proteination	Approved stratings and adapts. Possible Neurosci Bir relies samp to Dis for higher relies value. Approved interrupt and leaves. Possible Neurosci Ris relies relevang and leaves. Possible Neurosci Approved theorings and deays. Possible Neurosci			
8210013 8000013 8000013 8000013 8000013 8000013 8000013 8100013 8100013 8100013	77 100 90 100 100 100 100 100 100 100 100	an Ji Ji Diyest Beng	Agens Agens Agens Agens Distantion Distantion Distantion Distantion Distantion Distantion Distantion	Marcicle 10, 2010 extended intervance (Col-PD) fails of another intervance (Col-PD) fails of another intervance (Col-PD) fails (Col-PD) fails (Col-PD) fails (Col-PD) fails (Col-PD) (ColPD)	agenoved deterings and Adaps. Procedor Neurosci De onto stand p. 15. to higher moler value. Approach interrup, and beaux. Procedor Internal file value, respire 15.5 on tigher inder value. Approved interrup and design. Procedor Neurol dari value resetty to Pricto higher state: value.			

Figure 47: Risk Identification and Risk Management

4.3.14 Moving Money Between Boundaries

First Estimate \$149,358,000	\$162,000,000 EMP Contract Signed		Funding Request \$148,629,000
Outerio	The Constant	Start of Construction	First Shared KPIs
	Target Value: \$1+1.000.000	17/15	
		1744	
HAJOR HILESTONE SCHEDULI			(A) No. E vouder detaily

Figure 48: Expected Cost Throughout the Project

In order to drive the design to the Target Cost, the team kept track of:

- (1) At-risk cost of work
- (2) Not at-risk cost of work
- (3) Contingency
- (4) Realized savings
- (5) Risk items
- (6) Anticipated savings that have not yet been realized
- (7) Realized profit
- (8) Anticipated profit on remaining work, and (8) the design team's burn down rate.

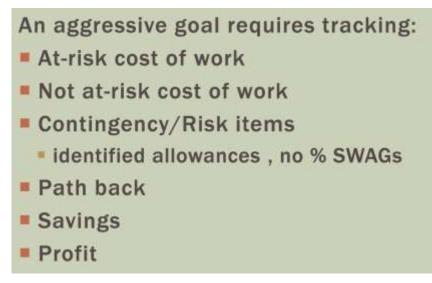


Figure 49: Cost Tracking

As a way to realize their full profits, the team kept track of cost saving opportunities (Figure 50). They placed all of their opportunities inside an Excel sheet that they called "The Path Back". In the figure below, the team needs to achieve \$2,935,744 in savings in order to recognize 100% of the planned profit.

The Path Back				
We must work towards (2.(335,744) in Project Savings, in ord	ler to recognize 10	0% of our pla	nned Project Profit.	
Here's how we get there				
Item	Value	Date	Comment	
IV Escalation Contingency Reduction	0	Done	Escalation will be managed on the "Risk" tab	
JV Buy out of commodity trades	0	Done	\$118,800 recognized in the April Budget	118,800
MP to target 3.5% general conditions personnel cost reduction	0	Done	Recognized \$150,000 in savings on 3/30	150,000
JV Buy out of commodity trades	0	Done	\$181,200 recognized in the May Budget	181,200
MP to reduce copper costs by 4%	0	Done	Recognized \$50,000 in savings on 6/19/12 budget meeting	50,000
JV Savings on Inc 2 and 3 (Anderson Settlement Savings)	0	Done	Recognized \$29,893 in savings on 6/19/12 budget meeting	29,893
JV Remove all Davits shown on drawings entirely	0	Done	Recognized \$13,000 in savings on 6/19/12 budget meeting	13,000
Team Betterment of schedule due to slurry	0	Done	Recognized \$200,000 in savings on construction contingency risk on 6/19/12 but	200,000
JV Savings in Cost to Complete (Steel, Rebar, Site Utilities)	0	Done	Recognized \$150,000 in savings on 7/17/12 budget meeting	150,000
DF to target \$17,325 in framing productivity gains	0	Done	Recognized \$17,325 in savings on 7/17/12 budget meeting	17,325
MP Rad Farm Deduct	0	Done	Recognized \$18,000 in savings on 8/21/2012 budget meeting	18,000
MP Field Riser Productivity Gains (Mechanical Piping)	0	Done	Recognized \$15,000 in savings on 8/21/2012 budget meeting	15,000
MP Hanger Shop Prefab Productivity Gains	0	Done	Recognized \$39,000 in savings on 8/21/2012 budget meeting	39,000
MP Plumbing Cast Iron Productivity Gains	0	Done	Recognized \$100,000 in savings on 8/21/2012 budget meeting	100,000
MP Hanger Field Productivity Gains	0	Done	Recognized \$30,000 in savings on 8/21/2012 budget meeting	30,000
JV Savings in Cost to complete (Earthwork, Rebar, Steel, Fencing)	0	Done	Recognized \$150,000 in savings on 8/21/2012 budget meeting	150,000
JV Incentive Plan for Commodity Trades (Doors and Flooring)	0	Done	Recognized \$20,000 in savings on 8/21/2012 budget meeting	20,000
A to target \$22,500 reduction in reimbursable costs	0	Done	Recognized \$22,500 in savings on 9/25/2012 budget meeting	22,500
MP Savings in Roof Duct	0	Done	Recognized \$40,000 in savings on 9/25/2012 budget meeting	40,000
MP Shop Propress overhead productivity Savings	0	Done	Recognized \$10,000 in savings on 9/25/2012 budget meeting	10,000
E to target 5% in material buyouts	0	Done	Recognized \$80,000 in savings on 9/25/2012 budget meeting	80,000

Figure 50: The Path Back

For the work at risk, the team developed the following categories to track the finances: (1) Joint-venture, (2) Mechanical and Plumbing, (3) Electrical, (4) Drywall and Framing, (5) Fire Protection, (7) Owner's scope at risk, (8) Design Contingency, and (9) Construction Contingency. Every month, the team reviews their current monthly budget report and compares it with the previous month's budget report (Figure 51). They documented risk and opportunity items that were realized in that month and the associated change in the cost that resulted from them. The total monthly change in cost is documented as the "Month Delta". All items listed on the budget report include: (1) the dollar impact, (2) the parties involved, and (3) a short description. To facilitate the movement of money between organizational and

cluster boundaries, each transaction also includes a documentation of the parties that the funds are being transferred from and to.

get & Billing Update							
A		c	D	r.		G	
and a characteristic	PTCE	Feb-12	Mar-12	Monthly	Transfer	Transfer	81201920 B. D. C
Team Member	Budget	Budget	Budget	Delta	To:	From:	Description
Joint Venture (JV)	54,674,642	54,841,765	55,204,368	362,603			
	1			11.546		UHS	Gas Conveniente feet
				1,000		DC DC	Support Steel for Standpipe
				30,000		OC .	Increase in Knowneys 3 costs
				25,000		0C	Reducion of Storm drain line WLS due to depth
				25,000			ACD # 2 Extend Ambulance Canoon
				10.000		DC .	ACD # 6 Expand Area of CO tank and increase will endourse height
				38,429		30	Replace flaw live from Marganta to Pechange Parkway
				25.000		DC DC	Revised Deportals Profiles (URS miss)
				10,000		50	Stati chapressions in internet stati
				3,000		100	Added Naborins and Timper Louis Chock RT # 5001
				110.000		26	Approved Landscape Drawings
				-101	56		Reduction in Approval offsite plans ACHO, DAWD, SP
				42,012			Province of 25% Direct East Present
				0	Unior	apred to be apr	
Mechanical & Plumbing (MP)	24,615,454	24,396,259	24,428,656	32,397			The second se
HEADING CONTRACT THE WAY		100000000000		4,635		17	Spanner brackets provided to FP
				4,252			Blue bangers provided to PP
	-			21232			
				7,500		oc	Added is list on 4th Roam
				7,500		30	New housekeeping slavet
				8,500		14	Added drinking fountain to waiting room
				152.000		00	Additional BM Core

Figure 51: Budget and Billing Update

The team documented all owner-initiated items in a spreadsheet. For each item they recorded: (1) a description, (2) the members involved, (3) the dollar impact, (4) the driver of the scope change, (5) the reason for the scope change, (6) whether or not the scope was added on a "whim", and (7) whether the change was foreseeable. Using this process, they were able to track changes to the scope and determine who is financially responsible for the change -- the IPD/TVD team or the owner.

What specific scope drove the change in cost?	Why did the scope change?	Did we challenge the scope change in person? With who?	What was our basis for challenging the scope?	Was the decision to add the scope a "whim"	Should we have known?
Change in mat'l and labor. Increased sewer line from 8° to 10°. Changes in grade after site was already graded.	In order to capture the future sewer stubiouts for the fitness center due to its focation on site the sewer was increased in size in order for proper flow throughout campus.	No. Site unforeseen.	NA	54A	No. Unforeseen conditions.
Change in mat'l and labor. Shifted a roadway and ug utilities.	URS did not analyze the flood plain correctly. Under calculated the flood plain and utilized an out of date drawing.	Yes. Challenged with Excel and they indicated that it was designed wrong.	We had an approved drawing from the city.	Noi	Yes, URS should have understood the flood plain calculations.
Staff assigned to the project unable to proceed with the construction of the building	The reviewing agency did not have the staff to expedite the approval of the Environmentally sensitive area	The team affered to pay for an independent reviewer however this was not acceptable to water district. The team also offered to pay for the in house reviewer's overtime costs and this was also shot down.	The review period was specified to be 90 days and it exceeded this amount.	No this was due to lock of	We could not have expected to know that the review time would take so long.
		The team affered to pay for an independent reviewer however this was not acceptable to water district. The team also affered to pay for the in			We could not have



4.3.15 Challenges During Design

After starting the project, the team faced many challenges that increased the estimated cost (Figure 53). Some these problems arose from legacy designs that the team had inherited from the architect that left the joint venture. As they looked at the design further, they discovered items that were not included in their estimates or were not finished in design (e.g., extra 12 in width in patient rooms). The

preconstruction manager from the Joint Venture commented: "The increases in cost during the design phase is very common when detailing from an initial schematic design. These are often expected on most projects." In total the challenges increased the total project cost from \$144 MM to \$156.6 MM. The \$162 MM number shown in figure 11 also includes the owner's IT/IS budget. Some of the cost increases during design (Figure 53) would typically be taken from an owner's contingency. On this project, the allowable cost was all that the owner could spend for this project and there all cost increases, regardless of its origins, are part of the project's cost.

Total Challenges	\$12,642,000
Water Management	\$470,000
Utility Re-Route for Well/Culvert	\$200,000
Site on Flood Plain	\$665,000
IT/IS Systems Budget	\$6,000,000
Extra 12 in.Width in Patient Room	\$605,000
Elevator Utilities For Future Growth	\$50,000
Cost to Grade Entire Site	\$330,000
Convert "B" to "I" Occupancy	\$1,200,000
City Conditions of Approval	\$2,170,000
Bad Soils and Deep Foundations	\$952,000

Figure 53: Challenges That Increased Cost

4.3.16 Innovations During Design

The Target Value Design process started in Q4 2010 and lasted until the start of construction in Q3 2011. During this time, the team was able to develop innovations that resulted in a \$16 MM savings. Figure 54 shows \$13.3 MM as the anticipated savings from the TVD process. During the schematic design phase, the superintendents from the general contractors took an active role in planning the construction sequence with the architects and engineers who were designing the project. The effort to include the superintendents in the early design phase allowed the team to make improvements to the construction schedule and saved 6 months from their initial schedule. The 6 months reduction in the schedule resulted in approximately \$2.25 million in savings from the general conditions alone with much greater benefits for the client in terms of being able to open the hospital early. As a result of the innovations and the reduction in the project's schedule, the team was able to save ~ \$16 MM during design. According to the owner, team saved an additional \$7 million during the construction phase due to improved labor productivity as a result of applying Lean in the field.

Innovations With Cost Saving Impact

\$3,000,000
\$1,300,000
\$500,000
\$500,000
\$1,000,000
\$3,000,000
\$1,200,000
\$400,000
\$1,178,000
\$725,000
\$568,000
\$13,371,000

Figure 54: Target Value Design Innovations

4.4 Steering to Targets During Construction

4.4.1 Last Planner for Construction

The team used the Last Planner to coordinate the work of the trades during construction. The weekly planning meetings included the representatives of the key trades (i.e., superintendents and foremans), project manager, and architect. The goal of the Last Planner is to increase the reliability of the workflow and the hand-offs between the trades. The team developed and updated their Last Planner schedule on the wall with stickie notes. At the end of their planning session, a project engineer would enter the data into the OurPlan software. The team used OurPlan to track and visual the commitments and production schedule.



Figure 55: Weekly Planning Meeting

4/26 Friday		4/29 Monday	4/30 Tuesday			6/1 Wednesday												
Fab Task71,F1-0 hurse Stations Aires 3: Tel Fibor: Pla.,		PaeTasx74,P1-4Cor paneing	IDF/MDP Complete		FathTask76,F1-6													
		Ama 4: 1st Floor: Pla				Area 5: 3st Filser: Pla		÷										
Menanei Hert Milly, Co., Iec.		Mousian Bell Mig. Co., Inc.	(2PR) Barnet, a Joint Se			Mouse fiel Mg. Co., bu.		÷.,										
Fab Task 75, F1-5 Nurse Station 1222		FabTask75,F1-4Cate Paneling	Electrical Power Energized			din Floor IDF Set Switches			átart.		U						×.	
tree 5 Tet Floor: Pla.	ar				torp		Lastabase					26	1.00	1.0	1.0	1.00		. •
APRIL OL PROPERTY AND		Area 4 love 3.4 soil () promise	10.0 h	1.7	Southand In		Ales D. Still Flass	14 14	415.75									
Banara Ball Mit, Co., Inc.		History O Mad Eq. Televatory Anto			OPRI Tumer		tat/Poor Plan T	14	# 22 M	-	-							
enter per lat, co, ac.		the flow that Guards	47		Care Spanial		Ares # 1th Finer		400.0	-								
Final Connection to Cetting Out		Set un LA Taket Accomment	43		RCE .	-	Aven A 100 Films	V	424 10	-	-	_						
		Sight - Bit to tail of DW being			DFR Down		Relation (in From				_	-						
		The first the loss of top-door			DPH Drawel		Palancia 104 Film		474.10									
ORs: Anna 7: 1st Floo 12 days Southland Industries		Plan: Din for any I firm a			Despisetie (Anta D Set Filter	24	474 10									
		2 dags	Anthena att	M.	Designation 1		as free Plan T	44.										
		Electric 1 50 Ph top down and ine			Paraset Have		Reports the Plan	24	420.76									
		In for the WARgoost	pro una ego	17	Degeneration	Carper .	Faturds Int Tox	14	4213	Contract of		_						
Install cauting 6 detail exterior		4th Fi	\$ spay 42	CM .	Taraset Mad	attern .	Paralise Un Floe .	24	ANT		-							
		Bwitci : Mit in waysty	425	10	Farmerer mad	-	Faturela (th Figs.	1 day	426.0		1.1							
		C Milwork SEUF1-3	42	M	Mason Bull	stg .	Avea 2. Set Floor	24	675.7									
Aztarola: Shin: Plan:		15: UM Dog-Calling Tile 40	40	Te .	Ellipy Access	ice i	Whitem Plan T.	24.	104			_						
		2 days [198 Tales Accessories	9.9	1	1910		Aver 9, 10 Fam.	84.	ATTA						-			
MR Tarres, e.Juart Ve_		Andward 1 the fe Atoms sating the	fup 42	N.	Paralet Inc.	atten 1	Parande the Floe	1 step	479.9									
	-	📃 🖸 BARTE adequate	- 60	£	DFR Drymall		Petutik Un Flox -	84.	822.00									
Fuel Oil Monitoring		CVOR DIT Data Packing in t	te Setch	P	Despisetor:	Cerpe	ID. UHS IT Plan	80.	425.0	4					_			
Contrast contrast local		PROOF () Sh Drout Not Not	. 50	ŧ	Begéette I	lager.	Sin Ploor Plan T	18.	425.8	-	-							
		Dis Floor OF Set Sweet	10. 10.	ŵ.	(historical Has	mini.	IE UND IT Flax	14	47674			0	_					

Figure 56: OurPlan

In addition to tracking the Percent Plan Completed (PPC), the Temecula Valley team also kept track of the Task Made Ready (TMR) and Task Anticipated (TA). "TA measures the percentage of tasks anticipated on the lookahead plan two weeks ahead of execution. TMR measures the performance of lookahead planning in identifying and removing constraints to make tasks ready for execution" (Hamzeh et al., 2012).

To measure the covariance of the variables for TMR and TA relative to PPC, we use a statistical tool known as the Pearson Coefficient. The Pearson Coefficient of the PPC and Task Made Ready (TMR) is .79; this suggests that there is a strong correlation between the percent of TMR and PPC. The Pearson Coefficient of the PPC and the Task Anticipated is .2; this suggests that there is a weak correlation between the percentage of TA and PPC. Hamzeh et al. (2012) hypothesized that: "improving the performance of lookahead planning (i.e., increasing TA and TMR) results in improving the reliability of weekly work plans (i.e., increasing PPC)". More data are needed to independently verify these findings. Additionally, a theory is required to explain why there is a strong correlation between PPC and TMR and a weak correlation between PPC and TA.

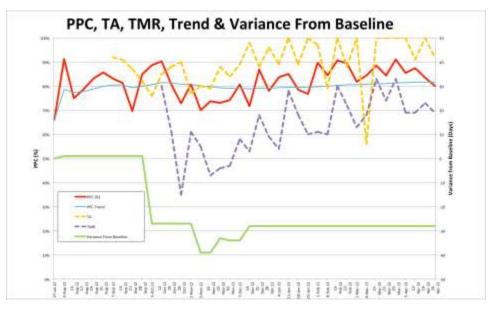


Figure 57: Percent Plan Completed

4.4.2 Location Based Planning

For the production planning, the team used a line of balance software from Vico called Flowline (Figure 48). To use the Flowline software, the team first divided the building into 4 different zones (a, b, c, d) for each floor. On the vertical axis of the Flowline software is space (floor and zone). On the horizontal axis is the timeline of the project from the beginning to the end of construction. The goal of the line of balance (also known as location-based planning) is to ensure that only one trade is working in an area at one time and thus avoid the problem of trade stacking. The line of balance tracks two things: (1) when a particular trade should be working in a particular area and (2) the anticipated production rate of each trade assuming a certain crew size. First is shown by when the trade's color line crosses the box that is surrounded by a space and time intersection. The slope of the trade's line shows the later. The slope is a visual representation of production rate ($\Delta Y/ \Delta X = \Delta Zone/ \Delta Time$). For example, if a trade can complete zones A and Zones B in 1 week their production rate would be 2 zones per week.

The location-based plan supported and was used with the Last Planner to improve the reliability of workflow and PPC. The Last Planner uses reliable commitments, a lookahead schedule, constraint removal, and learning from breakdowns to improve PPC over time. The Last Planner does not explicitly tie the production with the layout of the building and as result commitments may be made which are not physically possible with trade stacking. The location-based schedule uses the physics of the building to further support the objectives of the Last Planner.

The location-based planning was developed by the superintendents who had the most knowledge on construction techniques and anticipated labor productivity rates. The superintendents helped developed the Flowline schedule during the design development and their involvement helped the team shorten the schedule by 6 months. The interviewees reported that for the trades working in the field, the Flowline schedule was much more intuitive to visualize their work than Gantt charts.

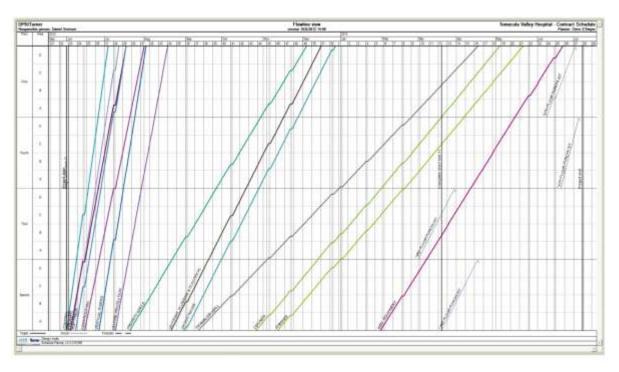


Figure 58:Flowline for Location-based Planning

4.4.3 Value Stream Mapping

One of the reasons why the Temecula Valley project was able to hit its aggressive cost and schedule targets was their practice of bringing Lean to the field crew. The TVD/IPD team encouraged their crews to practice 5S and conduct Value Stream Mapping studies. The people who were "doing the work" took video recording, analyzed the videos, identified waste, and developed ideas to make the process more efficient. In total, the TVH team conducted over 150 value streams and video recording studies. The team extended Lean training beyond just the members in the risk pool. One such example is the door installation trade, which was a Lump Sum subcontractor (Figure 61). Using Value Stream Mapping, the door installation trade was able to reduce waste and improve their profitability.



Figure 59: Video Recording of Work



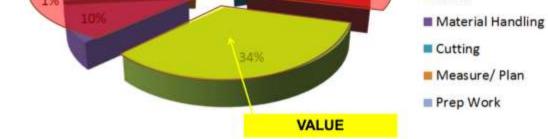


Figure 61: Waste vs. Value



Figure 62: Video Study of 2nd Floor Exterior

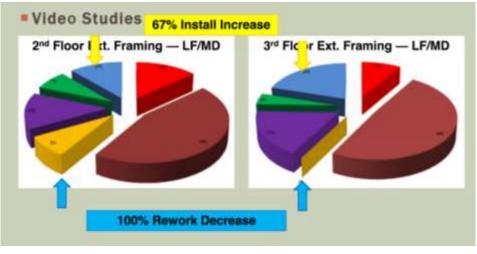


Figure 63: Resulting Improvement from Video Study

4.4.4 Process Mapping

The Temecula Valley team developed process maps for some of the most common activities. Figure 64 and Figure 65 show a process map for an RFI and Submittal. The goal of the process map is to make tacit knowledge transparent through documentation, to standardize their processes, and to seek opportunities for improvement from the current state.

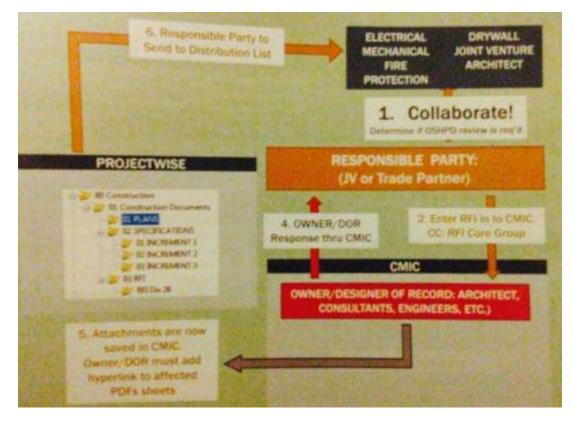


Figure 64: Process Map for RFIs

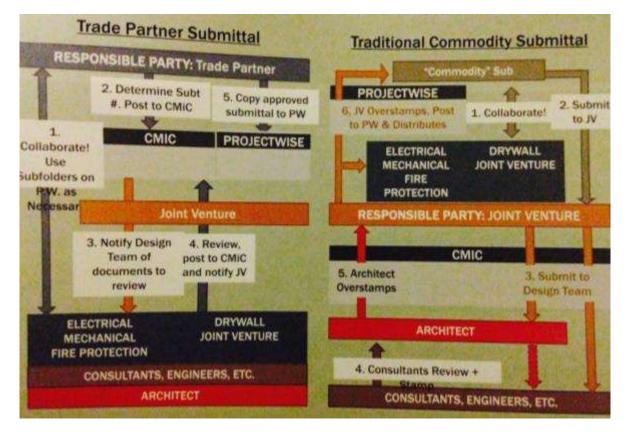


Figure 65: Process Map for Submittals

4.4.5 First Run Studies

In addition to the Value Stream Mapping studies, the field crew also conducted several first run studies. The first run studies allowed them to simulate the work either with mock-ups or through discussion to develop a plan for installing key components. Additionally, the first run studies allowed the team to collect preliminary data on labor productivity. Using the productivity data, the team could determine whether or not they can meet their productivity objectives and take corrective action early. They could also significantly reduce constructability risks and they can have better data of the overall prior to construction so they can better allocate their time and attention on the more risky scopes of work.



Figure 66: First Run Studies

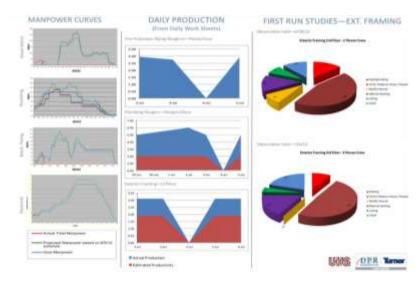


Figure 67: Production Rates and First Run Studies

4.4.6 5 Whys Analysis

The team used a 5 Whys Analysis to find the root cause of problems and take action to prevent the problem from occurring again in the future. The 5 Whys Analysis was used to diagnose and fix problems that can came up from the Last Planner's PPC tracking. Figure 68 shows a sample 5 Whys Analysis.

Why 1	_	Why 2	_	Why 3		Why 4	_	Why 5		Why 6	-	Witty 7	Root Dates	Returning Prevention
Enternor touril plate was not tratailed to allowable construction tolerances	T	Beet piele was shop welded and was subported to racking and seriorization in travel and during welding	-	Protein to two facilitate the process and speed up the recent.		(*************************************							Destudent was not per incentration Discontinues	fant wed law pare far wy the will styr.
		Peet team rentered team and sating the load too and right roof to QC the protoen because from facts were beined unitari- facts were beined unitari- facts were beined unitari- factors of the typess factors												
		Pieli teor-Schrof adoparaty GC Toors 2-4	,	If was not bypass homing to it was not thought to be as articled		Decause if was stall to unch as it was thought that the alocances was not an aloca							Pregarience with the Dictantional and PPE with and where they also	Constraint detected adfress to the to the send paster with a banger ang to tradition realizer of the data or accord only to the last detect for a segment of the send detect for a segment of the data of the second of the data of the second of the second sector of the second s
		Project team surveyed all the form to see if there was an issue but rathing was clarified on towor		Sorveyer chi noi lake ensisgi peinte.	,	The points that were taken did not note an local op Alem did not request more points.	-	We were ensurine but ret gradue					Manang anal Kar Ban Jak	Utilities as activing lines pairs the minimum pairs and waters in the former, that and allowed and the followed as a former of the
Cohernel was not installed fluid to the four of the exterior term prote.	-	Geology documents alreaded if Machael T	ľ	Encourse I was thought and/y on by design feam that the radius of the term plate equal ranks the channel share as the lower plate was field tack. This was also done to facilitate the web?	,	During charwing number field been ald not paid up the Sect that the C-channel was halt book.	-,	This space was now in the term to C offering dimension was not deemed official					Encomposition with soring the Contactual and the wate with Annuary Text the Contactual should be resvet above to the edge	C-Charmer already within the fact is the next plane with a longer legity for the line or solar of level plane or strand roles to reach facts from the edge 147-577 to facther solars.
			L	The adjector wall loo and bolton frace oid not have the overhang.	•	Design documents at aveal 8 overhanging 10°		Early docurrents showed detail with 1° eventsing but if was shanged to 10° with discussions from the project learn.	-	Teem had a concern that the wall almost out own tung out over the edge of Deck softer		Binos the C-stantel was moved in 1° the top and bottom trans had to be received in to the 10° overhang because the horizontel sict screw utautoment receiver edge distance to C-channel.	Mail to follow the C sharvest as the anterior was investiged	C-Channel draubt aither tei fuid te frei leint jalet with a langer hej to fastkeren militar of finet hete or attendi only tei het hete kom frei edge 10° 10° to teintere vedan.



4.4.7 Community of Practice (COP)

To facilitate learning and sharing of knowledge on Temecula Valley, the team developed their own community of practice (COP). The community of practice was modeled after the Lean Construction Institute's Communities of Practice. The members in the COP members met once a month for approximately 1-2 hours. The goals of the COP are to promote knowledge sharing, sustain the Lean culture, and to get the people who are responsible for the daily project activities to advance Lean implementation. All the members in the risk pool had a representative within the COP and they each

took turns in organizing the events. The COP events included a mixture of: (1) sharing internal best practices, (2) sharing lessons learned from another project, (3) having guests come to present information to the group, and (4) discussing Lean books that the team has been reading.

4.4.8 Shared Key Performance Indicators (KPIs)

This section documents the Key Performance Indicators that were recorded and shared with the Temecula Valley team. These KPIs appear in the monthly status updates to the owner (appendix 6.1). It is important to note that the KPIs first appeared in June 2012 – approximately 1 year after the start of construction. The reason for the shared KPIs to appear so late is that this was the first TVD project for most of the participants. Many of the practices of TVD are different that more traditional project delivery methods and it took some time to for the team to develop these KPIs.

The shared KPIs and shared financial tracking metrics were developed in response to Bill Seed's (the owner) question: "Are you going to make money on this project?" One of Bill's conditions of satisfaction for this project is for the team to make a reasonable profit. And although this might sound like an easy question to answer, it was big challenge for the team. Ken Lindsey from Southland (mechanical trade partner) rose to the challenge and developed a spreadsheet to integrate the team's spending, cost projections, and labor productivity rates. The main KPIs include:

- Financial Position
- Billed to Date
- Budget and Path to Budget
- Current Risks
- Schedule and Milestones
- PPC and Schedule Variance
- Man Power Curves
- Weekly Production Rates
- Monthly Rework
- Video Studies
- Lessons Learned / 5 Good Whys
- Project Photos
- Safety Metrics
- Inspection Metrics

4.4.8.1 Financial Position

The financial position shows the team's current cost and profit projections. The goal of this KPI is to communicate with the team the current state of the project and to encourage the team to work together to drive down cost and increase their profits.



Figure 69. Financial Position

4.4.8.2 Billed to Date

The billed to date keeps track of the total amount that has been spent relative to the contract value. This metric gives the team a good indicator of how much of the project's remaining budget is still malleable.

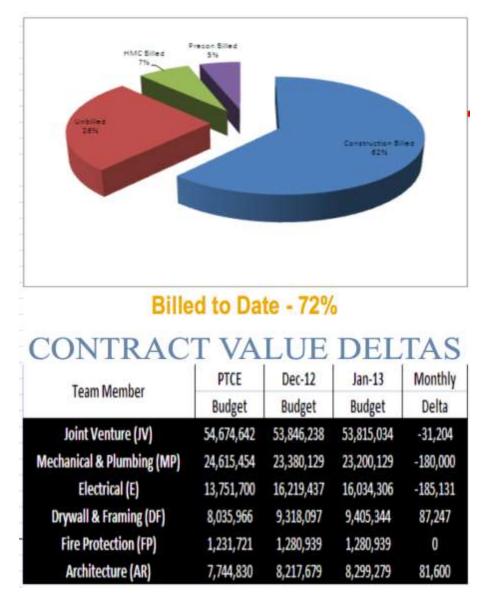


Figure 70. Billed to Date

4.4.8.3 Budget and Path to Budget

The path to budget is a list of opportunities that the team can still realize. The realization of these opportunities would allow the team to bring the project back to budget and increase profitability.

BUDGET

File	ik to	Contin	geneg	(ROMs)	

PATH TO BUDGET

DODOLI				A A B.
Flisk to Contingency (ROMs)				N Sevings 3
Design Contingency Rens				Team Const
		ROM	Owner	Team Const
Item	Value	Owner	Item Cost	MP-Hestin
JV Landscape Drawing revisions to onsite roadway realignment, revised berns and		1000 C	and the rest of the second	- Mit - Step O
toranital	50,000	ROM		MP - Flamb
				W Several
				MP Plumbin
JWA Helpad design/ER sharges/ Remove Old Helpathon Design	0	Over tern	790,000	Team Const
Team Nuc Med room charges	15,000	ROM		N levings 1
E Carl B for EMS	3,005	FIOM		Millistrk, F
UHSR Potenial IT/IS overuna	45,000	ROM		A to target 5
A Potential Changes in Endoscopy Room	2,580	ROM		Team Const.
Team CYOR Charge	-	ROM	1389,000	MP-Plants
Team - Center patient tracking boards (ACD # 004)	35,000	ROM	35,000	MP - Fiamb
DF - Val mounted laptop at Pptic locations Team - Colive Shop Revisions	13,266	ROM	10,256	MP - Sheet I
MP/E/DF - Changing Picom 1210 to results pendinghyating room 151 # 88.ACD #	600,000	7,00	86,099	DF Potentia
INERVIEW Chargegroom concerning programs control of a concern of a con	25,000	ROM	25,000	MP Plumbir
Team - Physical Therapy Room Charges (ACD #187)	20.000	ROM	20.000	Team Const
MP - Farvest ACD changes uddtonal litestopping	50,000	ROM		
DF - F6V engineering ceiling pervices and additional CA	24,000	ROM		Team Const
DF - OFFIG Columns	15,000	ROM		MP PM sevi
E - Added equipment at the Kitchen Island	4,224	ROM		E Labor Pro
E - ACD # 068 Added Roof Lighting	7,372	ROM	8	E Meteriel k
Factor for Unidentified Risks	1.80	1000		N Sevings 1
Suggested Design Contingency	415,362			N Savings
				Team Const
Current Design Contingency	419,362			A to target 5
				Team Const
Delta Suggested vs. Current DC	0			Team Const
	_			Team Const
Society Andrew An				Team Const
Construction Contingency Rems				Team Savin
	1000			Team Sevin
Item	Value	ROM	Owner	Subtota)
JV - Potential Additional GC's due to extended closeout	167,500	ROM	0	Add tional 8
Team - Additional IOR costs	50.008	ROM	0	Total
JV - Projected overain on the shared equipment yard JV - Revisions to the splay view as compression posts	10,000	ROM	0	10181
DF - Labor and Productivity Inguist on remaining floors	223.2%	ROM	0	UHS Owher
DF - Productivity projected loss on Lighting	200,000	ROM	0	Total
DF - Added material costs (ceilings) and equipment restal	100,000	ROM	0	n
JV - Labor to bring trush down in beu of trash shute	20,000	FIOM	0	Path B
JV - Change out roof screens to match new color	45,000	ROM.	0	Team Targ
JV - Added molding at list licer rool	15,300	ROM	0	Team Con
MPAJY - Added Hirating for the floots (Labor and temp heaters) for 3 months	75,000	ROM	0	Team Cons
MP - Farvest Contract Overun	56,000	ROM	0	IV Savings
DF - Additional revork since VII/U		FIOM		Team Cont
Agence	238,899	ROM	0	E to target
Escalation	15,000	R0M.	0	E to target
QA/QC	197,000	ROM	0	MP Saving
8-1	A DAM WAY	_	_	MP Sheets
Subtotal	1,707,716			MP Matha
Factor for Unidentified Risks	1.00			E to target
Suggested Construction Contingency	1,707,716			Team Cool
Current Construction Contingency	1,787,716			Team Con
Delta Suggested vs. Current CC				Path B
went auggesten as, commit co				

W Servings in Cost to Complete (Steel, Misc Metal, Stone, Rough Carpentry)	50,000	02/28/15
Team Construction Contingency Savings of QA/QC Item	25,000	02/19/13
Team Construction Contingence Savings of Escalation frem	15,000	01/14/13
MP - Heating Hut Water Piping Productivity	100,000	01/19/13
MP - Med Gas Productivity	85,000	01/19/15
MP - Flumbing Fixture Buyout	65,000	01/19/13
W Sevings in GC's	45,000	01/19/13
MP Plumbing Material handling labor savings	90,000	05/18/18
Team Construction Contingency Savings of QA/QC Item	25,000	05/19/13
W Sevings in Cost to Complete Roofing, insulation, Caulking, Doors, File proofing,		
Millinerk, Flooring, Painting (170,956	05/19/15
A to target \$22,500 reduction in reimbursable costs	12,500	05/15/15
Team Construction Contingency Servings of Agency Impact	100.000	08/19/18
MP - Flumbing Meterial Copper Bulk Buy	80,000	05/19/15
MP - Flumbing Seismic Productivity	110,000	05/19/15
MP - Sheet Metai Productivity	75,000	03/19/13
DF Potential Product/vity savings on Projections	60.000	04/18/13
MP Plumbing Fixture Set Productivity Gente	40,000	04/16/13
Team Construction Contingency Serings of GA/GC Item	16,400	04/16/15
Team Construction Contingency Seilings of QA/QC (tem	16,400	05/21/13
MP PM savings	10,000	05/21/15
E (abor Productivity Savings	50,000	05/21/19
E Meteriel buyout Sevings	75,000	05/21/13
W Sevings in GC's	43,000	D6/18/13
W Savings in Cost to complete (Painting, Glacing, Krisher, DPC)	50,000	DE/18/13
Team Construction Contringency Servings of OA/OC Item	16,400	06/18/13
A to target \$22,500 reduction in reinitursable casts	12 500	06/18/13
Team Construction Contingency Savings of Agency Impact	100,000	06/18/18
Team Construction Contingency Servings of QA/QC (tem	16,400	07/18/15
Team Construction Contingency Sevings of GA/GC Item	81,400	08/20/13
Texin Construction Contingency Serings of Agency Impact	30,000	08/20/13
Team Savings on Permit Matrix	30,000	08/30/13
	150,000	09/50/13
Team Sevings on OSHPO Permit Costs.	and the second state of the second	03(30(13
	1,887,556	
Additional Reduction in DC and/or CC required	112,195	
/101#	2,299,951	
UHS Owner items recognized and potentially used if required at end of job	1,563,270	10/01/13
Total	5,773,223	
Path Back Items Realized This Month-\$750,000.00		
Team Target current schedule savings in GC's		35,000
Team Construction Contingency Savings of Schedule Item		50,000
Team Construction Contingency Savings of GA/GC item		25,000
JV Savings in Cott to Complete (Roofing, Survey, Landicape)		100,000
Team Construction Contingency Savings of Agency Impact		100,000
E to target the in labor productivity gains		75.000
E to target 4% general conditions cost reduction		45,000
MP Savings in Plumbing Field Supervision MP Sheetmetal duct install productivity gains		20.000
MP Mechanical Piping productivity gains		30.000
E to target 3% in material buyouts		75.000
Team Construction Contingency Savings of Schedule Item		\$0,000
Team Construction Contingency Levings of Schedule Item		

ngt in Plumbing Field Supervision trended dust install productivity gains hanital Piping productivity gains it 53 in malemail buyoots ostruction Contingency Savings of Schedule Item nstruction Contingency Tavings of Schedule Item Path Back Items Realized to Date

Delta Suggested vs. Current CC

\$3,277,418.00



4.4.8.4 Current Risks

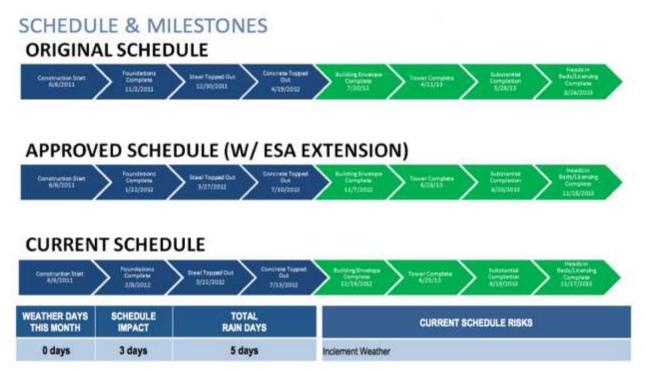
The current risks KPI lists the major risk items.

WEATHER DAYS	SCHEDULE IMPACT	TOTAL RAIN DAYS
0 days	3 days	5 days
		THIS MONTH IMPACT

Figure 72. Current Risks

4.4.8.5 Schedule and Milestones

This KPI tracks the key schedule milestones of the project.



SCHEDULE & MILESTONES

CONSTRUCTION ACTIVITIES COMPLETED THIS MONTH	CONSTRUCTION ACTIVITIES CURRENTLY IN PROGRESS	CONSTRUCTION ACTIVITIES STARTING WITHIN 30 DAYS
SOG Substrate	SOG Substantially Complete	Fireproofing on 1st and 4th floors
5th Roof Concrete Deck	Exterior Framing begins	Wall layout on 1st floor
Begin 2nd & 3rd floor wall layout	Fireproofing levels 2 & 3	Overhead utilities on 2 & 3

MILESTONES	ORIGINAL SCHEDULE	APPROVED SCHEDULE	ACTUAL
Building Pad Complete	8/26/2011	11/11/2011	11/4/2011
Begin Steel Erection	11/18/2011	2/13/2012	2/13/2012
Top Out	12/30/2011	3/22/2012	3/22/2012
First Deck Pour	3/8/2012	5/3/2012	5/1/2012
Dry -In Building	7/20/2012	11/7/2012	
Substantial Completion	5/28/2013	8/22/2013	
Department of Health Services Licensing		10/22/2013	
First Day Patient		10/23/2013	

4.4.8.6 PPC and Schedule Variance

PPC and Schedule Variance are metrics of the Last Planner. PPC measures the degree to which commitments in the weekly work plan are met.

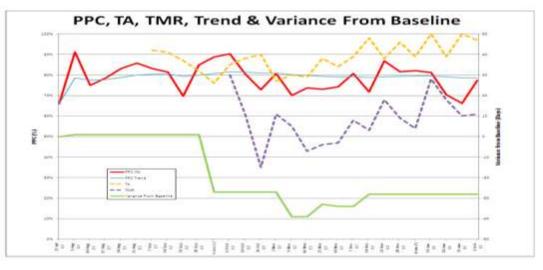


Figure 74. PPC Trends

4.4.8.7 Man Power Curves

The man power curves includes the projected and the actual labor hours of each trade.

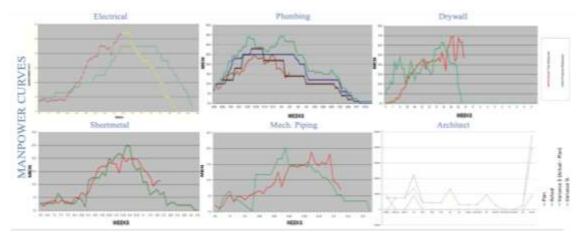


Figure 75. Man Power Curves

4.4.8.8 Weekly Production Rates

The team tracked their production rates for each crew on a weekly basis. The actual production rate is compared with the estimated or target production rate, which was set at the beginning of the project. The production rate tracking revealed that their Lean operations in the field had a positive effect of the crew's productivity rates. This metric was key in allowing the team to forecast their anticipated cost to completion in the construction phase.

UNIT	BUDGET	ACTUAIS TO DATE	N SAVINGS	TA COMPLETE	5-00.12	12-04-12	19-04-12	N-00-17	2-804.57	1.Nor-12	ti-hor O	25.809.52	Hi-Nov 5
	and and					and and and							
EA/MD	2	2.5	75%	10%	2	1.	1.8	1.5	8.5	13	22	5	1.5
LE7MD	15.7	-46	34%	100%	25	22	-81	14.4	34.4	66.4	45.5	526	78.8
LF/MD	24.5	24	45%	91%	26	16	10	14.2	18.5	12.2	58.6	18.0	384
													_
UF/MD	37	12	125	100%	43		-	42	28	1.7	288	121	- 182
LE/MD	11	18	48%	83N	- 13		-		28	-	-	-	40
HRS/EA	5		20%	100%	4		·		2.8	64		- 4	
UT/MD	42.4	- 6	15	52%	18			11.3	18.5	73.3	86.3	11	28
L5/MD	21.9	.51.8	78%	10%	-	-	28.1	41	111	65.3	75	10	- 18
HRS/EA	- 3	1.0	17%	56%	3		1.3	1	1.3	1.3	-	LA	-
HR5/EA	1	1.8	40%	72%			1.86	8.52	1.	3.8	1.8	-	-
11111111								1.1.1.1					
HRS/RM	24	30.5	15%	100%	20.5	78.5	38.5	28.5	28	29	n.	- 22	- 30
HES/MM	36	28	11%	100%	-		18	IJ.	17	39	13	- 33	82
HES/RM	24	19	22%	100%	-	-	-	24	100	29	21	22	- 21
UF/MH	1.8	1	54%	575	3.8	-	1.8	-		-	2	-	
SF/MH	41.5	84.8	-32%	93%	85.1		81.5	-	- 10	-	6.43	75.6	34.5
35/MH	81.3	67	-75	90%					-	-	75.8	-	-
EA/MH													
ľ	5A/MD 17	EA/MD -2 U/AMD -2 U/AMD -35.2 U/AMD -37 U/AMD -37 U/AMD -37 U/AMD -37 U/AMD -32 HIS/TA -5 HIS/TA -5 HIS/TA -3 HIS/TA	EA/MD 2 E.5 U/MD 25.2 45 U/MD 25.2 45 U/MD 37 77 U/MD 37 77 U/MD 37 77 U/MD 41.5 4 U/MD 42.8 69 U/MD 42.8 99 HBS/TA 5 L8 HBS/TA 2 L8 HBS/TA 2 L8 HBS/TA 24 19 U/MD 34 21 HBS/TM 24 19 U/MD 1.3 2 97/MH 41.5 8L3	SA/MD 2 2.7. 25% SA/MD 33.2 44. Md5 U7/MD 33.2 44. Md5 U7/MD 34.5 21. 45% U7/MD 37 21. 45% U7/MD 37 72.1 95% U7/MD 31. 56 48.2 U7/MD 42.8 45. 45% U7/MD 42.8 45. 97% U7/MD 42.8 47. 47% U5/MD 38.5 51.8 197% HIS/FIA 5 1.8 97% HIS/FIA 3 1.2 44% HIS/FIA 5 1.8 175% HIS/FIA 2 1.3 2.25% U7/MD 24 19 233 U7/MM 1.3 2 54% U7/MM 42.5 0.1 22%	SA/MD 2 2.5 25% 89% U/MD 33.2 45 M05 100% U/MD 34.5 21 45% 92% U/MD 24.5 21 45% 92% U/MD 37 72 19% 100% U/MD 31 10 480% 22% U/MD 11 10 480% 22% U/MD 11 10 480% 22% U/MD 12.4 4% 97% 100% U5/MD 21.5 51.4 19% 100% U5/MD 21.5 51.4 19% 10% H5/MD 24.3 1.2 40% 72% H5/FM 24 10 213 100% H10/FM 24 10 213 100% H10/FM 24 10 213 100% H113 2 M05 116% 10% 1//MH	SA/MD 2 23/i 25/iii 89%i 2 U/MD 15.2 45 24/iii 100% 23 U/MD 15.2 45 21 45% 20% 11 U/MD 24.5 21 45% 20% 16 11 U/MD 27 77 95% 200% 69 11 U/MD 27 77 95% 200% 69 11 U/MD 21.3 46% 47% 20% 11 HES/TA 5 8 20% 100% 6 U/MD 42.8 4% 97% 100% 6 U/MD 42.8 4% 97% 100% 2 HS/MO 28.9 51.8 97% 100% 2 HS/MO 24 19 215% 100% - HS/FRW 24 19 215% 100% - U/AMB 1.3 2	SA/MD 2 2.5 25% 80% 2 1 U/MD 15.2 44 MMK 180% 61 87 U/MD 15.2 44 MMK 180% 61 18 U/MD 24.5 21 46% 91% 16 18 U/MD 37 72 95% 100% 60% 11 U/MD 37 73 85% 100% 61 18 U/MD 37 8 20% 11 64 62% 11 HES/TA 5 4 20% 100% 61 11 U/MD 42.8 4% 4% 90% 10 11 HES/TA 5 1.8 97% 100% 2 10 10 HES/TA 34 31.5 100% 20% 10 100% 20.5 10 HES/TA 34 21.7 100% 20.5 10.5	SA/MD 2 2.5 25N 89% 2 1 1.5 SA/MD 33.2 44 MMS 100% 21 1.6 18 UF/MD 34.3 21 465 92% 16 16 18 UF/MD 34.3 21 465 92% 16 16 18 UF/MD 34.5 21 465 92% 16 16 18 UF/MD 34.5 21 465 92% 11 UF/MD 31.7 71 UF/MD 31.9 51.8 79% 188 UF/MD 42.8 4% 4% 97% 98% 2 5.3 UF/MD 31.9 51.8 79% 98% 2 5.3 UF/MD 31.9 51.8 79% 98% 2 5.3 UF/MD 34.8 97%	SA/MD 2 1 1.3 1.6 SA/MD 2 2.5 12% 1.0 1.4 1.6 U/MD 13.2 4.6 MAS 120% 2.1 1.1 1.6 1.6 U/MD 13.2 4.6 MAS 120% 2.1 1.6	SA/MO 2 1/5 <td>SA/MD 2 1/h E.3 1/h 1/h<td>54/M0 2 1<td>SA/MO 2 2.5 JSN 07% 2 1 1.5 1.6 5.5 2.1 2.2 5 U/MD 15.2 41 JMS 3005 21 22 41 J46.4 96.4 96.4 96.8 938 136 136 136 122 41 J46.4 96.4 46.8 938 138 136 14.2 135.5 112.2 54.6 18.8 138 137 14.6 146.2 135.5 112.2 54.6 18.8 137 138 137 138 137 138 137 138</td></td></td>	SA/MD 2 1/h E.3 1/h 1/h <td>54/M0 2 1<td>SA/MO 2 2.5 JSN 07% 2 1 1.5 1.6 5.5 2.1 2.2 5 U/MD 15.2 41 JMS 3005 21 22 41 J46.4 96.4 96.4 96.8 938 136 136 136 122 41 J46.4 96.4 46.8 938 138 136 14.2 135.5 112.2 54.6 18.8 138 137 14.6 146.2 135.5 112.2 54.6 18.8 137 138 137 138 137 138 137 138</td></td>	54/M0 2 1 <td>SA/MO 2 2.5 JSN 07% 2 1 1.5 1.6 5.5 2.1 2.2 5 U/MD 15.2 41 JMS 3005 21 22 41 J46.4 96.4 96.4 96.8 938 136 136 136 122 41 J46.4 96.4 46.8 938 138 136 14.2 135.5 112.2 54.6 18.8 138 137 14.6 146.2 135.5 112.2 54.6 18.8 137 138 137 138 137 138 137 138</td>	SA/MO 2 2.5 JSN 07% 2 1 1.5 1.6 5.5 2.1 2.2 5 U/MD 15.2 41 JMS 3005 21 22 41 J46.4 96.4 96.4 96.8 938 136 136 136 122 41 J46.4 96.4 46.8 938 138 136 14.2 135.5 112.2 54.6 18.8 138 137 14.6 146.2 135.5 112.2 54.6 18.8 137 138 137 138 137 138 137 138

Figure 76. Weekly Production Rates

table (this little title) this

N.

One of the advantages of tracking labor productivity on a weekly basis is that the team can experiment with their production system (the batch sizes, work packages, crew sizes, etc.). The rapid feedback between action and result means that the team could run small experiments to uncover hidden nuggets for improving productivity. Instead of rely on heuristics, myths, and our assumptions of productivity; the experiment-based approach uses real to inform decisions.

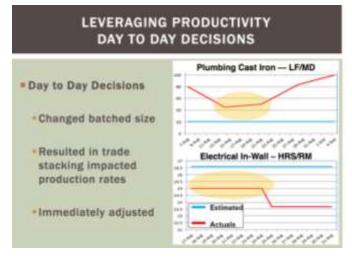


Figure 77: Leveraging Productivity Data for Day to Day Decisions

Using their productivity data, the team decided to re-sequence the work of the drywall and the cast iron trades. They decided to install plumbing before framing contrary to the traditional method. This sped the overall process and although the cost increased for drywall and framing, the team saved an estimated

\$200,000 in plumbing costs. The team was only able to make this change in the work sequence because they had modeled all of the framing studs and had very good data on the production rates.

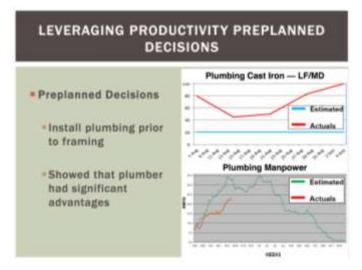


Figure 78: Leveraging Productivity Data for Preplanned Decisions

For the Med-Gas trade, the team found that they were more productive when they worked over-time. The conventional way of thinking is that productivity decreases with over-time work. This trade required a significant amount of set up and set down time and their scope of work required intense concentration. By working overtime, the Med-Gas had longer stretches of productivity, higher rates of tool time, and a quieter working environment during the after hours.

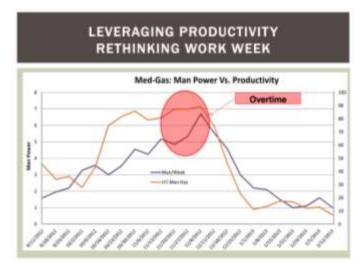


Figure 79: Leveraging Productivity Data for the Work Week

4.4.8.9 Monthly Rework

The team tracked the rework of the electrical, plumbing, drywall, and HVAC trades and included this information in the monthly report. The goal of the rework tracking is to use the 5 Whys Analysis to identify the root causes for why these rework items occurred so that they could take preventative action. According to the team's documents, they observed 592.5 labor hours of rework, which is equivalent to

\$38,512.50 (assuming \$65 per labor hours). It is unclear exactly how much cost savings were realized from this practice since that information was not documented.

Oute .T	Hours -	Trade *	Description -	Reason	5 Why Scheduli
1-0d	10	Drowall	Uncoordinated duct openings at CUR	Openings were added after model was completed. There was a note on the drawing to coordinate however it was missed.	Tes
1-0ct	10	ne literal	Changed out 20 ga. Studs to 10 ga. for crash railed missed at the 1st floor	Crashrails were missed by F&W or HMC	NO
1-Oct	13	Drywall	Added 4 carriers that were not modeled on level 2	Missed in the model	No
1-Oct	- 6		Studs were missing in a bay of wall. The bottom track was not marked	Layout guy missed	No
15-041		Drywall	1st floor exterior replace sheathing at HM frames	Sheathing should have been cut more to facilitate door frame install.	
15-Oct	16	Drywall	2nd floor nurse call rework above doors	Uncoordinated in BIM model, Was not placed	
15-0ct	16	Drywall	5th floor fixing top track at jamb studs	Extended z-clips to far out and jamb studs could not go to the deck. Z-clips cut back.	

Figure 80. Monthly Rework

4.4.8.10 Implemented Improvements

The team shared a list of their key improvements in the monthly reports. The goal of the improvements announcement was to commend the efforts of those who came up with new ideas and to encourage all the people on their projects to innovate.

Drywall

 Use Sprayer for final pass on Level 4 Finish will improve productivity.



Figure 81. Implemented Improvements

4.4.8.11 Lessons Learned / 5 Good Whys

The team reported their key lessons learned and results from their 5 whys analysis to the monthly report.

Perform '5 Why's' quicker so that the lessons learned can be implemented sooner. Some opportunity has been lost by not doing this.

Have pull plans mid-morning in lieu of early. This helps the constructors to start their crews first and then focus on pull plan.

Maintain continuity in clusters from design through construction. Have a handoff as people change during the project.

Reflection was performed on the check-in process. Some items that came out were to make it electronic and combine with pull plan.

Combine constructor and design pull plan in lieu of separate times.

5 Why Issue - Humidifier piping had to be re-piped because it conflicted with the elevation of the beam/fireproofing. Piping is gravity feed.

Root Cause—FP was sprayed on too thick in some places coupled w' some construction tolerances created perceived elevation bust.

Recurrence Prevention—Issue and explain FP shop drawings to all effected trades. FP could have been scraped in lieu of re-piping.

Figure 82. 5 Good Whys

4.4.8.12 Project Photos



Figure 83. Project Photos

4.4.8.13 Safety Metrics

SAFETY LOG

TOTAL MAN HOURS	RECORDA- BLES	FIRST AID	LOST TIME	NEAR MISS
222340	01	8	0	0

Figure 84. Safety Log

4.4.8.14 Inspection Metrics

53 5 1433 0	1	•
h lafhaat		0
Normaly benefitied to a provide the second s		
N 3P(5) PAOR 5 2 min to the set of t	1	
		1111
(n C12568 C C C C C C C C C C C C C C C C C C C		
ress Schotzy Gaugetiat	3 1 1	

Figure 85. Inspection Metrics

5 Project Performance Metrics

5.1 Cost

The Temecula Valley Project began with a very aggressive Target Cost. According to the project team, the Temecula Valley project was completed for \$480 / SF which is 30% less than the average for California hospitals (Figure 86; Figure 87). In terms of the cost per patient bed, the Temecula Valley project reported a cost \$1.1 million per bed compared the \$1.8 million per bed average in California even though the Temecula Valley project had private rooms and window views in each room. The cost savings came from a rigorous examination of what was truly valuable to the owner, more thought-out design, less waste in the design process, prefabrication of building components, and increased labor productivity in the field due to first run studies and value stream mapping.

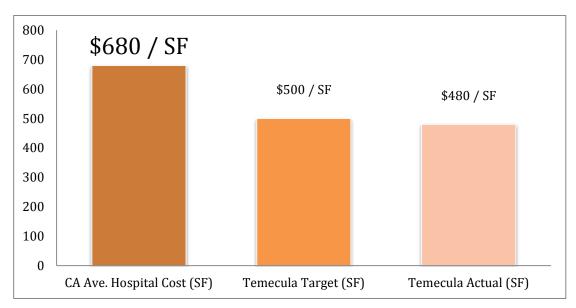


Figure 86: Cost per sf

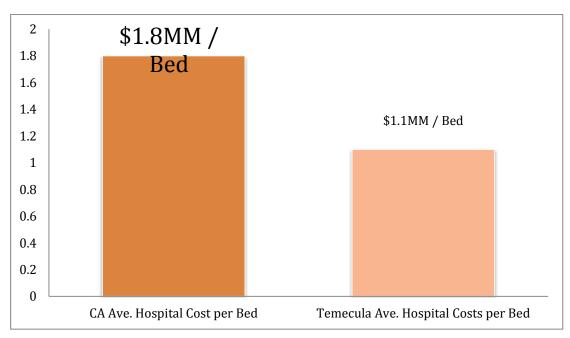


Figure 87: Cost per patient bed

5.2 Schedule

The project was completed a month-and-a-half ahead of schedule despite 82 days of delay due to environmental conditions (DPR, 2014b). The total duration was 18 months for the preconstruction phase and 2 years for the construction phase (DPR, 2014b).

5.3 Quality

According to interviews with 2 owner representatives, UHS is very happy with their project. They set aggressive targets in terms of cost, quality, and scope and were able to achieve them. The owner commented that the biggest thing they wanted from the project delivery method was reliability and cost control, which they achieved through this project. Since this research is solely focused on the design and construction phase, we did not investigate the quality of the facility from the perspective of the doctors,

nurses, and patients. Future research is needed to examine the quality of projects that use TVD and IPD with projects that do not use these practices. Post occupancy studies will be performed to determine whether or not the TVD process truly delivered the intended value to the users and patients.

5.4 Safety

Safety is an important metric for any project. According to the Temecula Valley team, out of 407,958 man-hours there was 2 recordable events, 13 first aid incidents, 0 lost time, and 2 near miss (Figure 85). One thing worth noting is that the number of recordable and near misses are the same (2 each). Typically, the difference there is one or two orders of magnitudes between the number of near misses and the number of recordable. Limited information about the safety program at Temecula Valley and how they recorded violations restricts further conclusion on these results. Construction safety is difficult to track because it depends on the person tracking it and the criteria used to measure safety violations.

SAFETY	LOG			
TOTAL MAN HOURS	RECORDA- BLES	FIRST AID	LOST TIME	NEAR MISS
407958	2	13	0	2



5.5 Productivity

Productivity was tracked for every trade and publicly shared with the team. Overall, the productivity of the project, through the implementation of Lean in the field, was greater than the projected productivity. The median labor productivity were:

Sheet Metal: + 16%

Mechanical Piping: + 77%

Plumbing: + 46%

Electrical: + 16%

Drywall: - 7%

In some areas, the drywall trade was less productive than they had planned. This phenomenon may be due to: (1) the practice of optimizing for the whole rather than for each individual scope and (2) being too optimistic about the anticipated labor productivity rate. For example, some trades might sacrifice their productivity if it helps the overall project be completed faster. Overall, the priority trades such as sheet metal, mechanical, plumbing, and electrical all had labor savings while the drywall trade (which has a lower labor cost) took a hit. In the example below, the Mechanical crew installing the black Victaulic piping finished the project over 4 times faster than their initial estimate. A project manager from the Joint Venture remarked that the drywall trade set the bar too high, which resulted in the final productivity rate looking less favorable than it should. It is important to note that these productivity metrics were measure based on the difference between the actual rates and the budgeted rate. As more data is gathered, we intend to do a comparison with other projects with similar scopes of work.

PRODUCTIVITY	r		ACTUALS		
DESCRIPTION	UNIT	BUDGET	TODATE	% SAVINGS	
Sheetmetal					
CAV Install	EA/MD	2	2.5	25%	89%
Round ductwork	LF/MD	35.2	41	16%	100%
Rectangular ductwork	LF/MD	14.5	21	45%	91%
Grills and registers	HR/EA	1	0.94	6%	59%
Roof Duct	LF/MD	10	8	-20%	100%
Mechanical Piping	-				-
OH HHW Copper Piping	LF/MD	37	72	95%	100%
OH Black Victaulic Piping	LF/MD	11	59	436%	83%
CAV Hookups	HRS/EA	5	4	20%	100%
Equipment Hookup	HR/EA	94	39	59%	100%
Plumbing		-	<u> </u>	-	
Copper	LF/MD	42.6	45	6%	93%
Medical gas	LF/MD	28.9	51.8	79%	103%
Seismic	HRS/EA	5	1.9	97%	98%
Carriers	HRS/EA	2	1.2	40%	72%
Fixture Set	HRS/EA	5	2.8	46%	42%
Electrical	-	-			
2nd Floor ICU Complete Rough-In and Wire	HRS/RM	26.5	23	138	100%
2nd Floor ICU Light Fixture Install	HRS/RM	12.3	12	255	100%
3rd Floor Med Surge Complete Rough-In and Wire	HRS/RM	24	20.5	15%	100%
2nd Floor ICU Finish Device	HRS/RM	12.5	9.3	26%	100%
3rd Floor Med-Surge Light Fixture Install	HRS/RM	13	11	15%	100%
3rd Floor Med-Surge Finish Device	HRS/RM	11.2	8.5	24%	100%
4th Floor Med Surge Complete Rough-In and Wire	HRS/RM	24	21	13%	100%
4th Floor Med-Surge Finish Device	HRS/RM	11.2	8.7	22%	100%
4th Floor Med-Surge Light Fixture Install	HRS/RM	13	10.4	20%	92%
Sth Floor Med Surge Complete Rough-In and Wire	HRS/RM	24	19	21%	100%
5th Floor Med-Surge Light Fixture Install	HRS/RM	13	10.9	15%	90%
5th Floor Med-Surge Finish Device	HRS/RM	11.2	9.4	16%	85%
Drywali					
1st Floor Priority Walls	LF/MH	1.3	2	54%	93%
1st Floor Top Out Board	SF/MH	41.5	32.3	-22%	93%
1st Floor Hang Drywall	SF/MH	61.3	57	-7%	90%
1st Floor HM Frame Install	EA/MH	0.5	0.3	-40%	33%
1st Floor Level 1 Taping Top Down	SF/MH	39.6	262	562%	82%

Figure 89: Labor Productivity

5.6 **Profitability**

Due to the cost savings in both the design and construction phase, the members of the risk pool were able to earn 150% of their negotiated profits, which was the maximum amount of profit that they could earn on the project. Out of \$111 of their at-risk-work, companies earned \$6 million in net profit, which is a pre-tax net profit margin of 5.1%. We currently do not have enough information to conclude how this profit margin compares with the industry average for a similar project. It is also important to note that the net profit margin is an aggregate of all the TVD/IPD members. For confidentiality purposes, we do not publish the profit margins of specific firms. It is worth noting that the profit margins of designers are

higher than that of contractors. Contractors have labor, materials, and equipment while the designer's main cost is labor.

5.7 Cultural Outcomes

In order to capture the cultural outcomes of the project, the researcher sent out survey to the Temecula Valley participants. The survey questions are based on Sutter Health's 5 Big Ideas. The questions were sent out in a randomized shuffle order, which eliminates the bias that can result from the sequence of the questions. Each participant was asked to rate on a Likert Scale to the extent that they believe the statements of Sutter's 5 Big Ideas were true for the Temecula Valley project. The scales for the responds are as follows:

1 => Strongly Disagree

2=> Disagree

3=> Neither Agree nor Disagree

4=> Agree

5=> Strongly Agree

In total 6 participants answered the survey and the mean score of their response is shown in Table 7.

Table 7: Cultural Survey Summary

Cultural Outcomes Survey (rated on a scale of 1 to 5)	Mean
1. The team collaborated, "really" collaborate	5
2. The project was optimized for the whole rather than optimized for local maxims.	4.8
3. The team tightly coupled learning with action	4.5
4. The project was managed as a network of commitments	4.1
5. Long lasting friendships and trust were formed as a result of this project.	5

The cultural survey showed very positive results. Four out of the five questions received a mean score greater than or equal to 4.5. The survey revealed the management of the project as a "network of commitments" is one area for improvement.

Often times project outcomes only measure the dimensions of scope, schedule, and cost. The human dimensions of project success in terms long last friendships, rapport, relationships, and trust may be just as important as the scope, schedule, and cost outcomes. Many of the participants will be working together on future projects and the trust that they build on this project will carry over to their next project. This survey showed that in addition to achieving the aggressive goals of the project, the team was also able to build long lasting personal and professional relationships. The Ah Ha Moments, which documented the team's learning and reflection on their lean practices, showed some evidence of the positive cultural outcomes that came from the Temecula Valley project. Below are some examples:

"I was touched by the threading emails showing compassion and concern about our team member." – General Contractor

"This was the best project in years." - Mechanical Trade Partner

"I feel that the people in the big room are friends". - Architect

"I reflected on the project during the holiday break and felt that it hasn't consumed me as with other projects. There were no worries." – General Contractor

"Once you are exposed to a lean project, you wish that all your other projects work this way." – Architect

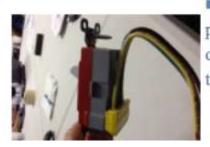
"At my office, my colleagues told me that I have changed. My thought process and procedures truly reflected the big room culture." – Mechanical Trade Partner

" I was able to create a pull plan for a dinner for my wife. The dinner was very successful and well organized." – Trade Partner

5.8 Product Innovations

The Temecula Valley team generated numerous innovations. Below are some examples of product innovations that were documented in the monthly reports.

Electrical



Plug tail device in lieu of standard plugs. Plugs only have to be connected on the backside reducing labor and troubleshooting

General



Carnie Hooks are being used for cord management. Inexpensive option and can be handed out to workers. \$3.00/ea.

Drywall/Framing



Utilize low torque screw guns for

backing due to heavy gauges.

Sheet metal made a shroud for the chop saws in lieu of the dens board to catch





sparks/debris.

Extension for roto hammer/torque wrench to install soffit top track anchor bolts. Made in the field by JM.

Electrical



 Feeders for distribution boards are grouped together on one reel by the manufacturer.



Utilized dust muzzle bought from local store to mitigate dust from concrete cutting. This item costs approximately \$60.00. Similar products sold by Hilti are \$1000 +

https://www.dustmuzzle.com/dust_collection/saw_muzzle.php

5.9 Process Innovations

In addition to the product innovations, there were many process innovations / improvements that reduced cost and increased the productivity.

Implemented Improvements

- Drywall/Framing
 - 4th & 5th floor kick off meeting. The same crews that are doing 2nd and 3rd are doing 4th and 5th.
- Mechanical/Plumbing



Filed down drill bit so that when the drilled is pulled away the bit separates.

Electrical

 Tracking labor differently from productivity report outs and will utilize moving forward



 Visuals for backing locations to ensure correct locations

Electrical

- Utilizing quarterly field surveys helps improve communication and extract ideas.
- Lead man coordination meetings in lieu of just GF's to improve communication.
- Utilizing Apple Facetime to quickly communicate a visual to engineers.

- Having lunch with <u>all</u> workers is adding value by spurring incremental innovation and increasing transparency with the entire project. Most workers have not had this forum previously.
- To protect prefab showers a sprayed on latex is going to be utilized. This idea was brought forth by the insulator. The question was proposed to the entire project and we received close to 20 ideas.

Electrical



Taking pictures with notes in them so that when the picture is issued to the field it is known what needs to be done.

Drywall

 Use Sprayer for final pass on Level 4 Finish will improve productivity.



Use a group washout for taping operations



General

 Utilize dashboard to reach information on the project more efficiently.

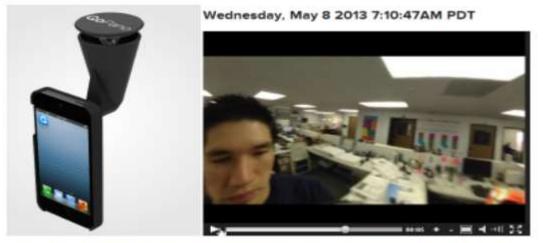
Universal Health Services Opgoing Construction Projects

http://www.uhsprojects.com

Immersive Media

360 degree interactive project tour. HD quality.

http://d2r78545clah05.cloudfront.net/Turner2/index.html



Utilize GoPano to record low quality 360 degree videos on the site. This is simple to use for field staff and good way to quickly communicate project progress.

http://www.gopano.com



VBI Door delivery—Based on last months delivery video they were able to reduce double handling and save 30 hours of delivery time on one floor. This was from the 3rd floor to the 4th floor.

Immersive Media

360 degree interactive project tour linked to floorplans

Utilize for partners/contractors not onsite

Progress photos

http://immersivemedia.com/content/





Figure 90: Garage Door

Typically the drywall framers would begin work after the mechanical trades. After the framing is completed, the electrical trades would come in and install the lighting fixtures and then remaining trades would come in and finish up the room. On this project, the team decided to spend more money to build a garage door system between the rooms. The garage doors allow framing drywall top out prior to large ductwork. It also creates a scissor lift path of travel from room to room. The inclusion of the garage door initially cost more money. This is an example of designing for constructability because the team spent

more money on the materials but gain back greater returns on the labor productivity. This innovation was only possible due to TVD because the builders were able to work with the designers in the early stages of the project.

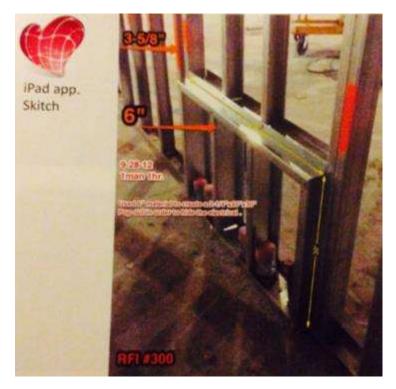


Figure 91: Using iPads to Document RFIs, Rework, and Change Orders

In order to expedite communication of RFIs and change orders, the team used iPads and photo-sharing applications to document problems.



Figure 92: Masking Top Track Prior to SFRM

They used a piece of blue painters tape and masking off the slots of our toptrack prior to Sprayed-Applied Fireproofing. Afterwards they can easily remove the tape and discard the overspray without having to chip and scrape the overspray from our top track. This saves labor on scrapping and cleaning, which would eventually follow.



Figure 93: Screeding Z-Clips

The drywall team installed Z-Clips to the thickness of the Spray-Applied Fireproofing. This allowed them to have the SFRM sub screed the bottom of the beam flat with the surface of Z-Bar. The benefit is that now when they install toptrack to the Z-Bar they don't have to scrape the monokote and sweep up. All the screeding waste is picked up in the fireproofers tarps.



Figure 94: All Materials on Carts

All the materials on-site are required to be on carts. The Temecula Valley team had a 30/30 rule. All materials on carts must be within 30 seconds or 30 feet from the installation site. This rule made sure that the materials were located near the scope of work and prevents people from hoarding space.

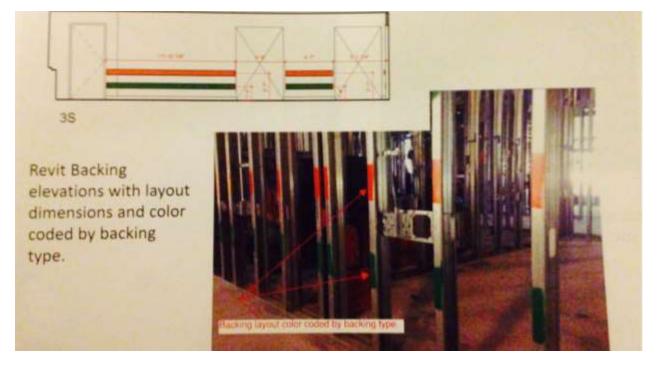


Figure 95: Backing Layout – Color Coded



Figure 96: Dry Erase Boards on All Floors

Dry erase boards were placed on every floor. These boards allow the field crew to quickly write notes and read pertinent information.

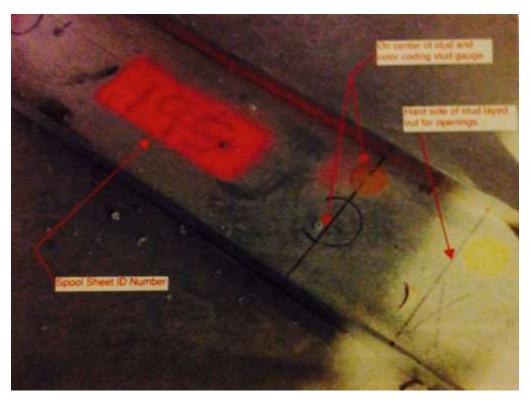


Figure 97: Spool Sheet Framing Layout

The layouts of the drywall frames are color coded and tagged. The color-coding practice (also known as poka yoke) helps reduce the number of mistakes and eliminates unnecessary measurement.

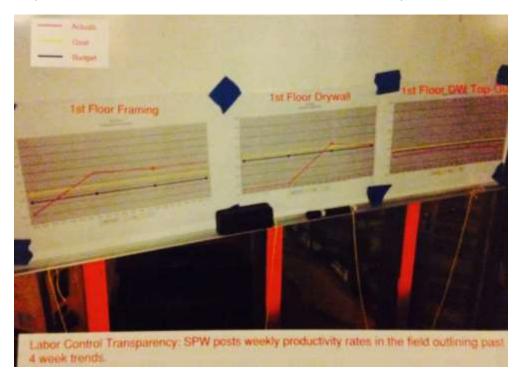


Figure 98: Labor Productivity Transparency in the Field

The labor productivity information is shown on-site for each crew. This information gave the field crew constructive feedback about their performance, promotes positive competition, and showed the field crew how their work is contributing to the project as a whole.

General

Scissor lift blueprint improvement



- Upgraded Project Inertia so that it has the ability to highlight inspection areas electronically.
- Small batching 1st Floor more than previous planned. i.e. Area 1A and 1B in lieu of Area 1
- Finished mock-up has been invaluable to team

- Drywall/Framing
 - Purchased cordless drywall screw guns based on worker feedback
 - Added spool sheets to kiosks and allow worker access at home.
- Mechanical/Plumbing



 Pre-program CAV controllers with battery and invertor in lieu of requiring permanent power.

 Utilize Tite-End True Torque nut in lieu of standard anchor bolt. Bolt snaps off at required torque and torque test not required.

Drywall/Framing



- Plangrid—Utilizing plangrid program to track rework and potentially use for punchlist/signoffs.
- Continuous bazooka for taping operations. Supposed to increase production by 100%

Plumbing/Sheet Metal

 Utilize inverter to test CSFD's with field staff and IOR's prior to permanent power.

General



Utilize countdown clocks for
 different milestones throughout the
 building.

 Utilize 26 ga. sheet metal in big room so that items can be magnetized to the wall.

General



http://www.photosynth.net

Photosynth has the ability to take 360 degree photos with a smartphone



Utilizing Plangrid now to perform all in-wall sign-offs. Previously we were just utilizing for punchlist/ rework. Reports have also been improved on Plangrid.





6 Conclusion

6.1 Challenges

The application of TVD and IPD on the Temecula Valley project was not without its challenges. Some of the challenges that the team reported include:

• Overcoming the natural tendency to design and make decisions from a silo perspective.

"There was one or two instances where people stayed silo and eventually failed. They ended up leaving the job." – General Contractor

• It is very easy to slip into old mindsets.

"When things get tough, people have a natural tendency to revert back to the way of working that had worked for them in the past." – Trade Partner

• Understanding the level of accuracy that is required at certain time in the design.

• The team required extensive training to understand the TVD/IPD process.

"If you are just coming from a design-bid-build [project] to a big room meeting it can be a shock." – Trade Partner

• Tracking production rates was very challenging.

"Each team had their own method for tracking productivity and it took us quite a while to understand each other's methods." –Trade Partner

- Developing trust within the project environment.
- People outside the risk pool did not want to go to the big room meeting.

"They thought that their work was too specialized and did not think that they should go to the meeting. There was one individual, a designer, that did not continue with the project for this reason. " – Project Manger General Contractor

- Some people did not collaborate as well and ended up leaving the project.
- Contractors do not have a lot of experience with design.

"Construction is very linear but in design you have lots of exploration of ideas. One of the things that we noticed is that contractors are used to working with finished drawings and they kept asking for us to freeze the plan. " -Architect

- It takes time and effort to learn other people's workflow. It took the team several months of training and working together to develop an understanding of each other's work. This common understanding ultimately led to design innovations.
- Overcoming the history of firms' previous projects with each other. Some people had prior working experiences with each other on some successful projects and some not so successful projects.
- There is a tradition of "fear" of asking others to improve (e.g. a trade partner does not want to challenge the general contractor).

6.2 Lessons Learned

The following are the lessons learned from the Temecula Valley project participants that they wish to carry with them on future projects. The information was collected from the interviews and a lessons learned presentation that the tem had put together internally.

• Make sure that everyone attends the onboarding orientation.

"When we had a failure from one of the trade partners and we would look back and realize that the failures came from the party that we did not include in the formal onboarding process." –General Contractor

• TVD and IPD require commitment and investment of time and money early on in the project.

"The start of the project is more staff intensive but what you spend upfront, you end up saving. The number of people in design is double than a traditional project. It may be difficult to convince an owner to spend as much money in pre-construction as required for an IPD/TVD project." –General Contractor

• "The importance of 'talk before drawing' ". – Architect

The team learned through their collaborative whiteboard sessions, that better design solutions comes from talking through the problems first with a multi-disciplinary group suggesting and testing out ideas. Only after the solution was agreed upon should the architect develop drawings.

- "The biggest practice was the trades sharing their production rate forecasts and actual production rates weekly along with the continual improvement ideas, mutual challenges to improve, and adjustments to help each other to improve." –Trade Partner
- Co-location of the team throughout the design phase is dynamic in terms of the numbers of days and the specific attendees.

There is no one size fits all for how to structure the co-location and big room meeting. At different parts in the project, different people are required and their commitments also shift depending upon the needs of the project. It is prudent to develop a co-location plan that is right for the project context.

• "We learn to share our thoughts and unfinished work with the owner and contractor to engage them in the evolution of the design (not just a critique of it). " – Architect

The design process became more collaborative and the iteration cycles were quicker when the architect involved the contractor, owner, and trades in developing design solutions. Rather than just relying on the contractor and trades for constructability review on a completed design, the architect was able to find much better solutions by involving the other parties from the beginning.

6.3 Processes that Led to Cost Savings

In this section, we list some of the processes that the Temecula team reported which led to cost savings on the project. These processes were reported by the Temecula Valley team through either the interviews or through the lessons learned presentation.

• Only having to design the building once.

"In the past, we would have to review shop drawings from the subs which is a copy of our own drawings. Every time that you pass the baton, there is a probability that you can drop it." -Architect

• Reduce over designing and over communicating in documents, reducing batch sizes of design products, and reducing unnecessary tolerances of the design.

"You don't have to specify all the criteria [in the design documents] because the person that you need to communicate with is there in the same room. Over specifying is a safety measure that we used [on more traditional projects] to protect ourselves. We also reduced the batch size of our design work. For example, we did not need to have the [whole] floor plan done all at once; we just need to complete the portion that is necessary for the next step. We can have different groups working on individual rooms. Parallelizing the working and making smaller batches allows the design work to proceed much quicker." -Architect

• Significant savings resulted from pooling resources and purchasing in bulk.

"When we looked at the trade's bids, many trades budgeted money for the same stuff. You don't have to buy it seven times if you identify it early. Instead it is better to just buy it once for the whole project and share. Items such as: fork truck, scissors lift, cleaning, insulation, fire stopping, caulking were shared on this project. In terms of materials, when we bulk order them, we could get a cheaper price." –General Contractor

• Taking a closer examination of how people do work.

"Having carts together so that people do not have to walk to get their tools, packaging and labeling materials, and putting everything on wheels [improved the efficiency]". – Trade Partner

• A continual search for opportunities for prefabrication.

"The exterior wall was prefabricated in major panels and brought up. The more work that you can do off-site, the more savings that you have in your labor rate in the field. On future projects, we plan on prefabricating the restrooms." –General Contractor

• Elimination of change orders and RFIs.

"I learned that there is so much knowledge from the subs and contractors that we can benefit from. IPD in a co-location environment was a huge benefit. If you had a question about clearance for a structural element, you have the structural engineering, MEP, and estimator to really give you the data to make decisions." -Architect

• More rigorous analysis of the owner's business case and value added components.

"There is a lot of waste in healthcare where a lot of things are overdone when they do not add value to the owner's business case. Corridors, hallways, and anything that takes up room in the building that is not functional is essentially waste. On Temecula, we designed a single corridor that is double loaded. In our concept we were able to reduce the corridor space by 30%. Certain spaces have common functionality but are used at different times and by different departments. We looked for ways to reduce duplicates. The client demanded that there be no departmental boundaries [in the operations department]. We also talked a lot designing the building to support the operations. " - Architect

• Money was able to move between boundaries.

"The fire sprinklers cost half a million dollars more but made the project progress better in other areas. This led to an overall cost savings" –Trade Partner

"We spend some extra money building the garage doors between the patient rooms. The garage doors had no impact on the final usage of the building but gave us greater efficiency during

construction because our scissor lifts, materials, and equipment could be more easily moved in after the drywall framing was already erected." –General Contractor

• Understanding everyone's perspective instead of just passing the blame.

"We are better informed and ready to make corrections. No one is sitting around pointing fingers. Since we are all there together, we cannot assign fault. It is a great experience when people want to find the best solution rather than point fingers. " –Architect

• Slowing down in order to speed up.

"We can now wait longer before committing to a specific design because we now have a better team." -Architect

• "Swarming" around problems.

"We were able to found cross-functional teams to quickly fix problems as they arise. Since we all share in pains and gains of the project, we did what was right for the project. We did not have to go through a lengthy RFI/Change Order process before addressing a problem." -Trade Partner

• Problem solving and documenting design alternatives with A3s.

"The A3s were great because it allowed us to document all of our ideas in one place. After doing several A3s, I realize that the results from the process is almost always different than my initial idea. By going through the [structured] process, I was able come up with more thoughtful solutions." – General Contractor

• Using A3s and Choosing by Advantages to make sound and transparent decisions.

"CBA helped us make more informed decisions. The method allows us to engage with the owner and ask for their inputs." – Architect

- **Design in "sets" and narrowing the sets based on looking at the whole of the project**, including price and schedule, and narrowing at the last responsible moment not rushing to make decisions early-on.
- Co-location of an integrated team that included the key trades.

"The trade partner's involvement was key in the TVD process. They had so much valuable knowledge to contribute to the design". - Architect

- Measuring productivity and openly sharing forecasts and actual rates weekly.
- The use of "plus/deltas" and rigorous efforts to eliminate repeat deltas.
- Periodic "reflections" using "start, stop, and continue".
- Increased level of trust between parties who are usually adversarial.

"Many of the members on this project have worked together on projects in the past. Some of those projects turned out well and some of those projects resulted in adversarial relationships. The ability to overcome the adversarial past and build trust was key to our success as a team." - Architect

• We focused on delivering the project rather than on our own companies.

"The shared risk and reward meant that we were going to be successful only if the project was successful. This made people focus on doing what is best for the project rather than what is best for their own team (e.g., moving scope of work to the parties who is able to do it the cheapest)." – General Contractor

• Improved quality of life of the individuals – had time for fun (golf, ping pong etc.), did not feel pressure to work 14-hour days.

" The processes that we used gave us much better control over the project as a whole. As a result, we spent less time fire fighting problems which made the work environment less stressful." – General Contractor

6.4 Areas for Improvement

The following are some areas for improvement from the Temecula Valley project participants that they wish to carry with them on future projects.

• Better communication of the business case and the Target Cost to the team.

Several of the project participants within the risk pool reported that they did not know the owner's business case and how the Target Cost was set. In the future, the team should spend time during the onboarding process to educate members about the business case. The team should know how and why their cost saving innovations relate to the business case. The target cost of the project needs to be grounded on the owner's allowable cost in the business case, otherwise the practice of setting a cost target can be construed as arbitrary and exploitative.

• Keep better notes from big room and coordination meetings.

One project participant reported that many good ideas were presented at coordination meeting but were not incorporated into the project. Perhaps having a dedicated person record the ideas presented at the big room and following up with the implementation can allow more ideas to be fully realized. One suggestion is to de-couple the person who raises an idea from the person who has to champion it. The team may benefit from more idea generation if people who do not feel the pressure of doing more work after they have raised an idea. After an idea is raised, if it is valid, the best person to carry the idea forward should take it. This person may or may not be the person who raised the idea in the first place.

• Apply BIM at the right time.

"On this project we brought some trade partners too early and try to have them model when not enough of the design was completed. We wasted money by starting the BIM process too early. "-General Contractor

At the time of the application of this project, BIM technology had not yet matured. There are still many opportunities to improve on the coordination, model-based estimating, etc. Determining the acceptable level of detail and what needs to be modeled was a challenge on this project and future implementation and research may help resolve this problem.

• Research better ways to manage BIM tolerances.

Tolerances management for the BIM model was reported as one of the trouble areas for the project.

• Motivate and incentivize members outside the risk pool to be as engaged as members inside the risk pool.

There were several instances where members outside the risk pool did not attend the coordination or big room meetings. One way to rectify this issue is to explicitly state that attending the coordination meetings is mandatory. Lump Sum contractors should be informed of this requirement and include it in their bid.

6.5 Updating the P2SL Current Process Benchmark on Target Value Design

Every case study project is examined for practices and methods that can be incorporated into a revised TVD Benchmark. The following features of the Temecula Valley Hospital project will be examined for incorporation:

- Modeling and simulation of healthcare operations
- On-boarding process
- Co-designing process
- Shared governance; including the joint pay application process involving all risk pool member companies
- Steering to Targets in Construction; including First Run Studies and tracking profitability

6.6 Acknowledgments

The P2SL TVD Research Group would like to thank the participants of the Universal Health Services (UHS) Temecula Valley project for taking time out of their busy schedule to share information and the lessons learned from this project. From UHS, Bill Seed and Tara Laski have been invaluable resources of information and knowledge. Steve Wilson from HMC Architects, Tom McCready from DPR Construction, Brent Nikolin from Turner Construction, Ken Lindsey from Southland Industries, Kristin Hill from Inside Out Consulting, and George Vangelatos from HMC Architects provided data and reviewed the report.

This research would not have been possible without the collaboration between the UC Berkeley's Project Production Systems Laboratory and our industry sponsors. Dean Reed from DPR Construction has been an adamant supporter of the research effort since its inception in 2010 and has been instrumental in funding this research. On the academic side, Professor Glenn Ballard and Professor Iris D. Tommelein have provided the direction and feedback for this research.

In addition to all the named parties, I would also like to give an extended acknowledgment to the men and women were involved on the UHS Temecula Hospital project. Their hard work and dedication has made this report possible.

7 References

AIA, 2007. Integrated Project Delivery: A Guide. AIA CC 2007.

Ballard, G., 2000. The last planner system of production control. PhD dissertation, Civil Engineering, University of Birmingham, Birmingham.

Ballard, G., 2009. Target Value Design. Retrieved on 06/02/2011 from: http://p2sl.berkeley.edu/2009-05-26/Glenn%202008-07-29%20=%20Target%20Value%20Design.pdf

Ballard, G., 2011. Current Benchmark for Target Value Design. P²SL Report. Retrieved on 5/2/2014 from: http://www.leanconstruction.org/media/docs/lcj/2011/LCJ_11_009.pdf

Ballard, G., Howell, G., 2003. An update on Last Planner. Proc., 11th IGLC Conference, Blacksburg, VA.

Ballard, G., Reiser, P., 2004. The St. Olaf College Fieldhouse Project: A Case Study in Designing to Target Cost. IGLC 2003.

Ballard, G., Howell, G., 2005. Relational Contracting and Lean Construction. Lean Construction Journal, 2(1), pp. 1-4.

Cohen, 2012. IPD Case Studies. Retrieved on 5/20/2014 from: http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aiab093703.pdf

ConsensusDocs, 2013. The ConsensusDocs Guidebook. Retrieved on 05/02/2014 from https://www.consensusdocs.org/Resource_/FileManager/300_Guidebook_08_12_13.pdf

Cooper and Slagmulder, 1997. Target Costing and Value Engineering. Productivity Press Inc.

Darrington, J., Lichtig, W., 2010. Rethinking the "G" in GMP: Why Estimated Maximum Price Contracts Make Sense on Collaborative Projects. The Construction Lawyer, 30(2).

Dell'Isola, A., 1982. Value Engineering in the Construction Industry.

Denerolle, S., 2013. The Application of Target Value Design to the Design Phase of 3 Hospital Projects. Retrieved on 06/02/2014 from: <u>http://www.targetvaluedesign.org/publication</u>

Do, D., Chen, C., Ballard, G., Tommelein, I., 2014. Target Value Design as a Method for Controlling Project Cost Overrun. Proceedings at the International Conference for Lean Construction.

DPR, 2014a. DPR-Turner Construction Company Joint Venture Breaks Ground Today on UHS Temecula Valley Hospital. Retrieved from on 5/2/2014 from: <u>http://www.dpr.com/media/press-releases/dpr-turner-construction-company-joint-venture-breaks-ground-today</u>

DPR, 2014b. Pushing the Limits of Productivity on New UHS Temecula Hospital Project. Retrieved on 5/2/2014 from: http://www.dpr.com/assets/docs/Newsletter_Case_Study_UHS_Temecula.pdf

Eisenhardt, K. M., 1989. Building theories from case study research. Academy of Management Review, 14: 532-550.

Feil, P., Yook, K.H., Kim, L.W., 2004. Japanese Target Costing: A Historical Perspective. International Journal of Strategic Cost Management. pp 10-19.

Flyvbjerg, B., 2006. Five misunderstandings about case study research. Qualitative Inquiry 12, 2, 219–245.

Frandson, A., Berghede, K., Tommelein, I.D., 2014. Takt Time Planning and the Last Planner. Proc. 22nd International Group for Lean Construction (IGLC-22). Oslo, Norway.

Hamzeh, F., Ballard, G., Tommelein, I.D., 2012. Rethinking Lookahead Planning to Optimize Construction Workflow. Lean Construction Journal 2012. Pp 15-34. www.leanconstructionjournal.org

Knott, T. 1996. No Business as Usual: An Extraordinary North Sea Result. The British Petroleum Company, London.

Lichtig, W., 2005. Sutter Health: Developing a Contracting Model to Support Lean Project Delivery. Lean Construction Journal, 2(1), pp. 105-112.

Macomber, H., 2004. Putting the 5 Big Ideas to Work White Paper. Lean Project Consulting. http://www.leanproject.com/wp-content/uploads/Putting-the-Five-Big-Ideas-to-Work-LPC.pdf

Macomber, H., Howell, G., Barberio, J., 2007. Target-Value Design: Nine Foundational Practices for Delivering Surprising Client Value. The American Institute of Architects, Practice Management Digest.

Matthews, O., Howell, G. 2005. Integrated Project Delivery: An Example of Relational Contracting. Lean Construction Journal, 2(1) pp. 46-61.

Monden, Y., Hamada, K., 1991. Target Costing and Kaizen Costing in Japanese Automobile Companies. Journal of Management Accounting Research, pp. 16-34.

Nicolini, D., Tomkins, C., Holti, R., Oldman, A., Smalley, M., 2000. Can Target Costing and Whole Life Costing be Applied in the Construction Industry?: Evidence from Two Case Studies. British Journal of Management, 11, pp. 303-324.

Raisbeck, P., Millie, R. and Maher, A. (2010) Assessing integrated project delivery: a comparative analysis of IPD and alliance contracting procurement routes. Proceedings of the 26th Annual ARCOM Conference, Leeds, UK, 6–8 September, Association of Researchers in Construction Management, Reading, Vol. 2, pp. 1019–28.

Sakal, 2005. Project Alliancing: a Relational Contracting Mechanism for Dynamic Projects. Lean Construction Journal, 2(1), pp. 67-79.

Seed, B., 2013. Personal conversation. 10/17/2013.

Seed, W. (2014). Integrated Project Delivery Requires a New Project Manager. Proc. 22nd International Group for Lean Construction (IGLC-22). Oslo, Norway.

Shook, J. (2009). Toyota's Secret: The A3 Report. MIT Sloan Management Review, 50(4), 30–33.

Sobek, D. K., A. C. Ward, J. K. Liker. 1999. Toyota's Principles of Set-based Concurrent Engineering. Sloan Management Rev.39(Winter) 67–83.

Suhr, J. (1999). The choosing by advantages decisionmaking system. Greenwood Publishing Group.

Thomsen, C., Darrington, J., Dunne, D., Lichtig, W., 2009. Managing Integrated Project Delivery. CMAA.

UHS, 2012. Annual Report. Retrieved on 5/13/2014 from: http://media.corporateir.net/media_files/IROL/10/105817/UHS_2012_AR_flip/UHS_2012_annualreport.html

UHS, 2014. Temecula Valley Hospital Newsroom. Retrieved on 5/3/2014 from: http://www.temeculavalleyhospital.com/community-information/newsroom/newsroom#.U4eq35RdXIo

Yin, R. K. (2009). Case study research: Design and methods (4th ed.). Thousand Oaks.CA: Sage.

Yook, K., Kim, I., Yoshikawa, T., 2005. Target Costing in the Construction Industry: Evidence from Japan. Construction Accounting & Taxation 15 (3),5–18.

Zimina, D., Ballard, G., Pasquire C. 2012. Target Value Design: Using Collaboration and a Lean Approach to Reduce Construction Cost. Construct Management and Economics. pp. 383-398.

8 Appendices¹⁵

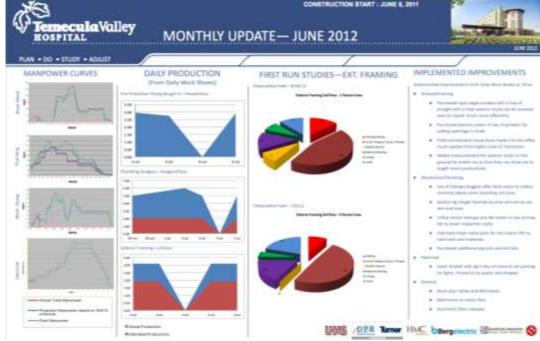
8.1 Monthly A3 Status Updates

8.1.1 June 2012

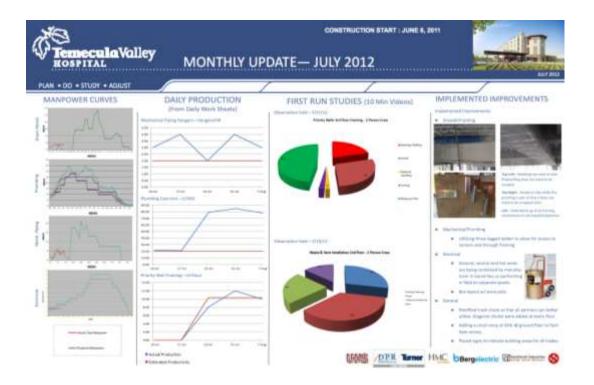


¹⁵ All appendix files are available at: www.targetvaluedesign.org.









C Temecul ROSPITAL				MONTHLY UPD	ATE	ر ر	CONSTRUCTION START : JUNE 4, 2011		<u>III</u>
PLAN + DD + STUDY + /	NUIUST		1						
BUDGET Into in watching or prefer into in watching or prefer into in watching or prefer into in watching of the intervention of the intervention of the intervention of the intervent	100	mm n[mmmi]	· · ·	PATH TO BUDGET Par Ata Patha Par Par Ata Par			BULLED TO DATE Add. SBB % Add. SBB % CONTRACT VALUE DELTAS Image Mark Mark </th <th>FINANCIAL POS</th> <th>Context Trans Profe</th>	FINANCIAL POS	Context Trans Profe
Territoria, Centrapora Nace Base Marcon estatutaria Marcon estatutaria	THE REAL PROPERTY IN CONTRACT OF CONTRACT.			much control Monte et al control times of a control of Monte et al control of the second of the second of Monte et al control of the second of the second of Monte et al control of the second of the second of the Monte et al control of the second of the second of the Monte et al control of the second of the second of the Monte et al control of the second of the second of the second of the Monte et al control of the second of the second of the second of the Monte et al control of the second of the second of the second of the Monte et al control of the second of the Monte et al control of the second o	1000 1000 1000 1000 1000 1000 1000 100	I NEED THEFT		C bBergrientin	- 100 rm - 100 rm - 100 rm - 100 rm - 100 rm

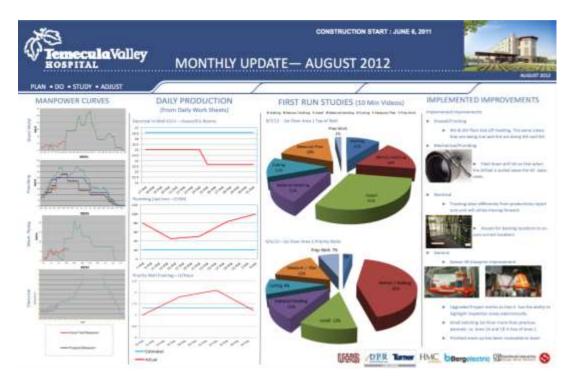




8.1.3 August 2012

Temecula ROSPITAL	Vall		MONTHLY UPDATE - AUGUST 2012								
PLAN + DO + STUDY + ADJ	1017						/				
BUDDET VICE CONTRACTORY	titter staff Ristantist-state	theread and the stresses	14 · 1 · 44 ·····	PATH TO BUDGET Variation Variatio Variation Variation Variation Variation Variation Variation Va		BILLED TO DATE	FINANCIAL POSITIONS				





8.1.4 September 2012

C. Temeculay HOSPITAL				MONTHLY UPDATE	CONSTRUCTION START - JUNE 4, 20 	012
PLAN + DO + STUDY + AD	UUST		1	/	/	
EUCOCOCY Not I Learning (Mich See Learning (Mich See Learning (Mich Michael Learning (Mich Michael Learning (Michael See Learning (Michael Michael See Learning (Michael See Learning (Michael See Learning (Michael Michael See Learning (Michael See Learning)) Michael See Learning (Michael See Lea	E Son-supersegue &	\$1010102 ² 000000000	lan Jaila		BILLED TO DATE W/ Pro-	FINANCIAL POSITITIONS CurrentProjectCarl CurrentProjectCarl addition additi
Security Transport Inte Sec Text United Security Constrained Security Research Constrained Research Constrained Research Constrained Research Constrained Security Constr		\$205553456 5	12	Experimental real projection Experimental real projection <td< td=""><td></td><td>no-basi huk carata</td></td<>		no-basi huk carata

Temecula Valley MC	CONSTRUCTION START JUN	R 2012
PLAN + DO + STUDY + ADJUST		
SAFETY INSPEC	APRICATE AND A APRIL APPENDING A APPENDING APPENDING A APPENDING APPEN	(ES
THE OWNER OF THE SECOND SECOND	or reaso easter reason or	and and and and and and
PPC vs. Baseline Schedule Vari-	-/=/-/-	
and the second s	APPROVED SCHEDULE (W/ ES	A EXTENSION)
\wedge		
-/ -/		
-	CURRENT SCHEDULE	
1-		
-	- Martin and the	Constant/Ohm
- market in her	PHOTOS	count hole
	- / -	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
much high magn black high high hast	Mart that that the	1
LESSONS LEARNED/AJ/GO	DD 5 WHY	And and a second se
Ap a service schedule and seguring shadd and be for the first weight and decreased Transformation of the project	Security Constrained a 2003 Million Security	AUDS AUDIANT Report
For reaching to not feasible lock stream of investigations and advantations as a proof and reach conservation		
Andreas gas charge filtings can be reasoned by heavy we finally string - more filter 4-PE degrees angle.		
As free respected policy period 1° work and free 1° serverals for black- ands to field path is table to be used a producted with 1 is research.		
the water descript of two 54 percents they in the	UMS /DER Ter	w HAC bergelectric Statestretrente



8.1.5 October 2012

AN + DO + STUDY + ADIL/ST		/	
17. 100	L MAR	VIDEO STUDIES (10 Min Videori)	
			The second second
with about and	The state	All set as former former	Santa Canto
	/		Control and Associate for Space proceedings. Comments Services production in 2009. Destrong Control and Associate Associate Associations Associate Associ
	77777777		 sal su su thus sump o su d prime a president. Uting type factors to pate annuare sin equipme.
in	Annual Annua		

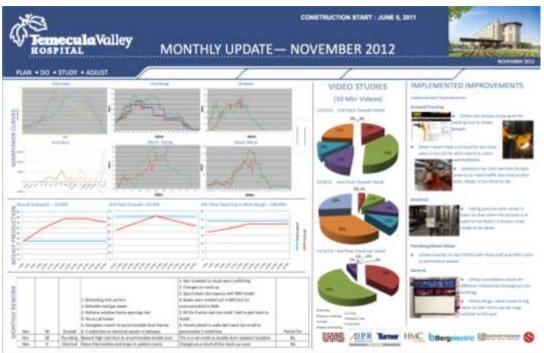


Temecula	Vall	ey		MONTHLY UPDAT	TE-	- 0	CONSTRUCTION START : JUNE 8, 20 DCTOBER 2012	
PLAN + DO + STUDY + ADJ	UST	2	1	1				
BUDDEET Wardingson (KMM) here foreignen (KMM) Marken (K	and and and another a	320000 ² 000000000000		And Antonia in a set of the	STRACT BUILDERSTRATES STRATES		BILLED TO DATE w/ Pre-Con	
Instrumenter Construmenteren Inst Versambelikken of Erick in som et annek i mensk Versambelikken of Erick in som et annek Versambelikken of Erick in som et annek Market anneken et anneken etta instrumenteren etta etta etta etta instrumenteren etta etta etta etta instrumenteren etta etta etta etta etta instrumenteren etta etta etta etta etta etta instrumenteren etta etta etta etta etta etta etta et		E2010111110		An end of the second se		a table	Testandi South State State State Testandi State	

8.1.6 November 2012

Femecula				MONTHLY UPDA	TE	- 1			2012		-	
PLAN - DO - 11007 - ADA	IST .		1					1			/	
BUDGET				PATH TO BUDGET			BILLED TO I	MATE	w/ Pro-Cr		FINANCIAL POS	SITITIONS
Ad to Dominant and the				New cost of our party large or strategy day	-	-	hander 10	and the second				
how Deliveration				14 Instanta Par In Contanta Tabe, Print 4.	1.00			- 14			Cluiment Propertitional	Current Tisses Prof
	-11-	-	-	Milliong A Spin Department (See Scripting Loos, opport, 1)		and the second	-					-
-	100	faut	And an	W townsee and one because production works	11.000	10.0010	-					
Philipping and a second state	1.00	10		Test has server over an array of the	122	10.0010	and the second sec					.555
Team Propage Burring allows	150	-		(# rop) Notestani (ang)	11.00	0.1010 0.7010 0.0010	-				ADDR .	.855.
and a local days of the second s	1.20	-		Withing includes from the first of herity products		0.000			0	1		
Automation Ph	- 186	10.00	100	Whereas is the balance inter warming the second sec	1000	10.041	Sec. 1		A COLORADO		ACCO	.484
Name and Address of the Owner of Street Stre	1990	100		OF the owner was sub-	11.00						10.0.0	
and the second se	0.00			New Construction Conference, Specing, of Grands 45, 1941	41.000	0.0010					Anna	
different second		1.0		Name of State of Stat	122	10,750.14						
ALC: NOT THE OWNER.			10.04	10 College Bally & Tenting Ten. at the	1.00			a sea The	a . 66%		10.00	1000
Presented and a set	100	12		New constant in the opposite for any of the fill and	11,000	100000-00					49.8.8	
Statements and and	100	100		And instantion interaction for the College Instantion	141.000		CONTRACT	VAL	IT DELTAS		49.00	ar
				Dense over anisoting Million & Printing, Naming-	10.00		CONTRACT	4394.5	LE DEPUND			A 1000
allocation for the location of	-			Are paperial interested in Architecture	11.040	0010010	Tax Name	100	1042 1042	Martine 1	4844	
and in the second second second	-			(i) in imposition of the product	1100	30.000.00		lige .	har har	Deta.	Action	1000
and these furnishing	18.00			188 Providing Colored Int Pranticement Honor	+0.00	Website.	Int Refue (10	10010	DODING MARKED	100	Acam	A DOLLAR DE LA DOL
				The construction to the period barries of the state of the local state.	11.04	0.001						
Michigh Info. Tarretti	15.04	<u> </u>	-	New Constant of Constants Sectors of States and	12	2011	Beloraci/Grant St.	3021.00	2005/24 1206/25	10.30	- particular -	And in case of the local division of the loc
				Name international international desired of 19678 (1987)	10.000	1004-014	Terral 21	12.1	3,96,95 11,811.9	14.2.2	ALC: NO.	
Internation Factory Company				Table internet in the second s	10.00	A	Tradition (II)	115.06	10780F - 1125.8E	12.00		
-	Adda.		i inne	We have be a provide some had showing tomong in home device	122	244	The statement of the			-	4 12	4 92
Contractor in Contractor in the	100	100	Antist	had been and an and an an an and an and an an an and an	16-86		The Residue (P)		128238 128238			
President of the second second	10.00	- 22	12	And the set of the second of the second seco	12		Address (M)	154200	KONT LOUIS	1.0		
Contract on the Contract of th	10.04	1.0	1.181	had mentered to repair a factory of the later.	1.10	-		-	1011		Starting Profile	
and Laborard Trees	10.00	10	1.1	New Contract of Softwares, Social, & Many York,	18.00	- 10,011		-	-	_		
Page and server of the International and		- 22	- 2-	Sectors States	100.000							
Transformation and Chill Date	10.000	100	1181	THE .	1.04.00							100
The state of the s	10.40	- 22	0.181	Design of the second se	100.00	-						1 mar 10
and a second sec	100	- 22	1.2	-	110,00							1144-14
and the second se	16.40	1.00	1.8	Ages had been beened the incase - (198-100-0).			·					A
the state	10.00		1.10	A through the set of the second secon					-			a phone has
	THE OTHER		-	Mr. Same and a second state of the second stat								Arct-110.
inter for Springeling West-	18			Martine Second States in Second			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					
Ingened Contractors Contemporer	1,000,000			Fart bod itsm, fealuation being			1000	11	モイイン	12	1111111	122
cannot if functions inter- Containguistical	1000.000			AL					0.000	-		1000
de lagerante, l'apert III				\$2,117,418.00					and the second second	12.5	and the second se	and the state of the
							CHOOSE STORE	12	R Ramor	HA	C bBergeiestric	STREET, STREET, STREET, ST





8.1.7 December 2012

Temecula Valley				MONTHLY UPDATE - DECEMBER 2012									
PLAN + DO + STUDY + ADM	NT .	_	1				/	/					
BUDGET			-	PATH TO BUDGET			BILLED TO DATE w/ Pre-Con	FINANCIAL PC	SITTIONS				
to in lating we detail					-	-	BUTTER IS BUILT HA LUE POLI						
				Teaching and the second strength of the	- 14		1	Current Project Cost	Current Team Prof				
the state of the s				Name of Concession, and Advances of Concession, and	-	-	and all the second s						
	-			the second se	- 1.46								
	-	bet bet		A set of the second sec	-			-					
And and the second state of the second state o	- 12	- 21		And a second sec	12				the second se				
and strands where the stand of			1000	Winter Control and States and States and	- 22		And a second		0.000				
Automation and a second second second			-	P and a second se	- 14		and the second s	48.00					
Concernance Concerns 10	10.00			of these to be an included and					and the second s				
Winey Lines	- 444	1.00		Approximate integrating of instances	-	10,767		10000	1000				
and second for a part of the second sec	1.00	100		And the second	1.40			And a second sec					
an information of the second se		100	1000		1.00				and the second s				
a beauting and				#h/mpmoniphaneuro	1.00			ADDRESS					
the first monthly and the second			1.000	Section and improvement and a features				and the second second	- Second Second				
e un la taman	144	- 2 -		A long of an a suggestioning homes in Fig. box. Strateling	C	-	General for Casto - 62%		Arrest Contraction				
No. for children inter-	1.00	- 21		Multi beg helg	10.0			and the second s					
and the state of t	1.00	- 22		Cologe No. in colour and	- 14		CONTRACT VALUE DELTAS	And in case	- A.M				
An Inca Tana Ann Inca	1.00		- 224	to the Republic Street Street Street	1.00		COMPLEMENT AND OF DETINO		A 100				
				Same instrument of the party of the local			I BE LAND AND AND AND	All	and the second s				
top to insufficial	- 10			definiting that the hand states	10.00	10.000	Taxibela	and the second s					
Aprentice interno	- 20.00			Sand Lines and Colleges Lines of Southern Street	- 1.04		hild have been be						
and hap interne	160.00			See Carry Anno 1999 and 1998 and 1998 and	- 14		sectored in the second second second second	1000	and the second s				
Recognition in the little				the paper like a second second	- 144		the state of some roots not be	ALC: NO	100 B				
	_	_	_	Name and Address of Contract o	14				-				
		_	_	All the second s	- 22		Read DOLD INCO KING OF	ALIMA					
and a state of the				New Connection Conference Service of Million Service	- 22		hedd/weight blink blink blink blink						
	100	100	-	A Direct Contractor on the provide	- 2.0		interest cars cars out		4 12				
And a second sec				head outputter contracts comp. I failed literal			Andered Units and allow the		Concession of the second se				
· Antiona (P. 16)	1.00	- 22	- 2 -	Second and an an address of the second secon	0.40								
- April - April	- 22	- 21	- 2-	New Instrumentations are get to be inst	1.00			tight man had					
Party inter-sector in the	- 12		- 2 -	Net intum comprising clark here	1.00				_				
NU LANGE CONTRACTOR OF A DECK	1.00	- 14	1.2	THE R. LEWIS CO., LANSING MICH.	100.0		and the second s						
and an inclusion of the second s	HER.	100	1.0	And the production of the Party Constant of	22		and the second se						
AND CONTRACTORY AND INCOME.		- 100					the second se						
F durin pagetta da anti-				the loss no signal evolution of the second party	1000				and the second s				
Pri	. 765	-	1.1	•	100.0		1		tion of the local division of the local divi				
	1.00			And water have the first the state of the state.					\$1011A				
	100	12	- 5 -			1000		and the second se	and the second				
						224			with the second				
and an operation in the local distance of the local distance of the local distance of the local distance of the	- 10	_		M manage in the line has a second or an and	1.00	1000							
	100					-							
and want the inclusion	-				-	-	112111212121	1111111	111				
the second statement of the se				1993 Text Reve Hallout 4, Inn				and the second s					
				SELSET, ALB. DE			USES /OPE Terror I	NC bBergetechne	Same and				





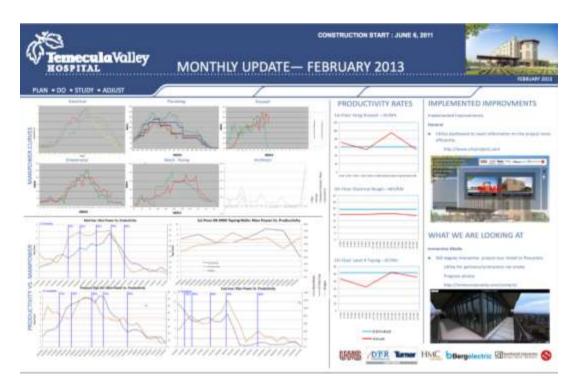
8.1.8 January 2013

Temecula	alle	SY.		MONTHLY UPI	DAT	ΓE-	– JANUA	RY 2013	-	-
PLAN + DO + STUDY + AD	usr		1	/						JONUARY 3
BUDGET		_	-	PATH TO BUDGET			BILLED TO DA	TE w/ Pre-Con	FINANCIAL	POSITIONS
to information protect				all the region in all of Contraction (State Table Tables Print), Claugh Information	-		and the second state of the second		The second state of the second	
the local sectors.				Not been an an an and all of a	16,000	10.64			Current Preject Cast.	Current Team Prov
	-	-	1		10.00	100			turner and the	
A set of the owner was an end of the second of				and an and a second sec	10.00	10.00				
Terral Control of the		1.00		Contraction of the second seco	10.00	1044	111		and the second se	
				Strategiese and a second	100	211	Contraction of the local division of the loc			
and the second se	1.02	-		And a second sec	- 140				2012.0	1000
A large and land	- the	100		Water and Dealer Safety states, here a little reasons.	100				and an	-
11 willia	1.66	1000		diverse frankas formagi			and the second second		44.24	A88.
Official Charge	4.4	. 494 .		where the second s	2246	10.00	and the second se		And an average of the second s	
A CONTRACTOR OF		- 22 -		Tank Antonio Complex To an Applements						
Commission and address of the second	1.000		1.00	W Annumber Concerns					24.8.8	1 A A A A
Contractor Specific Contractor	1.04			10 Participation						
· · · · · · · · · · · · · · · · · · ·			1.000	Wheels the matrix	1998	10.011			44444	1 Aug
All complete Contemportune (1997)	-	-	-		14,46	10.01			49.90	
 Report to a series of the serie	- 12		- 22	And the second s	1000		Uphant to D	No. THE	Statement of the local division in the local	And a local diversity of the local diversity
A A SALE OF COMPANY OF COMPANY			_	feet on which the second	- 100	-	and the second second	and the second se	1000	
 All signamproxy many series and affliced if 				Without .	-		CONTRACTOR & CONTRACTOR		10 Mar.	Address of the second s
And taken		- 22		has reach and	10.00	-	CONTRACT V/	ALUE DELTAS	10.00	
And the second of the second	100	- 22 -	in the second se	Street of head doors	14.000	Sec. 1	ME	Bell and Berly	40.0.0	A 100 1
AN IN STRATIGUESS	1000			Manage-10	14,000		Textilence 1912	5e2 3e3 8em		
apriori finite instrumente	14,000			With April Solid controls for the United States of Co.	16.000	10.00	8.44	helpe helper helper	Ar an article	100
and these lastered	-			New York of the Paragent, the age of \$100 to 1	100	10.61	winfester/ML WOLL	C DALL LILLA -L.M.		and the second sec
	_			AT A DESCRIPTION OF THE REAL OF	12100	. 10.61	all/better(V) AUUM	C 10459 10504 4.04	ALC: NO.	
AL Suprime Date M				The contract of the local sector of the local		222	Websity Manager 300.00	1007 1018 348	double and	100
		_	_	Contraction of the second second second	11.00	10.00			and the second second	
			_	Text of the second s	- 2.20	and the second	Terrar 12,71,7	8 9254T 109454 303	ACCESS TO A	
and the local data and t				Sector and a sector sector.	100	-	insued in terming (MC 12/10/14	town taking stor-	and a second sec	
	-	-	1	The second second		-				A 194
Name and Address of the Owner o	12.04	-07-	-7	Tanks .	1001040		Gardening Pt 121,51	Lakie Lakie e		
- concentrations	-		11.85	Charlot Annual Cill annual E. Annual	0.04	1.00	Address (M) THE	12110 12020 1200		and the second s
Named and 11th Contrasted of			1.2	10	100.00		the second se			
Andread 1 An other and a second second second				When it is a second of the local second	100,210	-		Frail Swatt Cought	- Traing Brudit	
Automatical and			- 2	100	1.94.634		1 million and the second se	Carl In The Carl		
Adaptacia concellado per agaitad desa	100			that had have been the best- of manual			tion in the local division in the			
- cape of Respondential Second And	- 22	- 22	- 2-	New York Concerning on the Party of the Part		1000				
- Children and Chi	- 22	- 22 -	- 21	Taxan Income to the part of th		10.000	1000			
No		100	1.1	Apple - College and a second state of the seco		10.000				
Contractions.	144	104		And a group of the second participation of the second se		10.00				
AND ADDRESS OF ADDRESS		- 22 -	-	The second secon		100				
	7 846	1.000	C-81	and the second se		100,000				a second
-	100	- 464	1.0	Manual Control of Control of Control Control of Control						100 at 100 at 100
	Contract of		_			1-14				And in case of the local data
the lattice in the second second	100.00			When an ob- the part of the pa		10.00				
and a first the first the first terms	10010			Name of the Article and the Ar		10000				
The First Contraction of Contraction	100108			the second		10.000	00000	レルリレイノノ	155211	111
				Park Hard Some Barland to Hale						
the Sugarantee Decision										
				63.277.418.88			READ IN	PR Turner HMK	The second se	and the second s



8.1.9 February 2013

~~~					CONSTRUCTION STAL	17: JUNE 4, 2011	24	
V'Temecula Vo	illey	MON	THLY UPDAT	IE— FE	BRUARY 2	013		-
PLAN + DO + STUDY + ADJUST	( <u> </u>		/		/			
BUDGET		PATH TO I	SUDGET		ILLED TO DATE 9	/ Pre-Con	FINANCIAL P	OSITIONS
e vitanges plates Spitzenges plates		Contract of the second se	ter and sing a last last	H	and the second		Current Project Dos	E Current Team Pro
tee Lanual Balanteens I de India Jepone Stations Inf	5.6	the survey	the families in the formula from				-	-
and the second sec		· Ball & Sectories	K-57-2011/202		-			100
Institutional Advancements Advancements and Advancements and Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancements Advancem	11111111111111111111111111111111111111	a Ball & Secondary		12 111		and the second	Anna	100
CONTRACTOR LA CONTRACTOR OF CO	_ 1	The second second	14.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.				An and	-2110
nd harden many of the located as Code Bay Reason. 8 - Dauge from Diversity projections are the Hild Community.			and a second	12 111			ALAR.	
A Contraction of the second state of the secon	10000	and many strength	ting county in the low to say the set		and the second			100
Philippes 17 Address March 18 Constant and and a const					Hiled to Da		AAAAA AAAAA	10.00 hmm
en de la constantina (1944) en este de la constantina (1944) en este de la constantina	10	A Second and a sec			ONTRACT VALUE	DELTAS	And a	200
	10.40	Register and a second s	neng of Della Sector	EPHI	Sardania Hill	and initial black beiget beiget bein	and share the state	Ann.
lignete Jacobili	1881		neige of sports hilling many of Solid Inter-	A	secretard) SUPUS	lighter wither him	ALAM.	-2.000
And a long and the		the set of the set	Property and a second second	and shows	Network Participant Internation	ADADE DUNCH (NAM	ALCON.	
Hand Annual (1997) - Series and Annual (1997) -	10 T			1010 - 0000	level 6 hereg (# 101.01	MENT LIST FOR		
A STREET OF STREET & AN ADDREET OF STREET	11111111111111111111111111111111111111				Nethodale(P) LISUIS Address(R) USUIS	FREE THEN IN		
An all showing a starging	114 10	1987				fortheast dough	r - Name Parks	
tores \$180 products to the second	8 8	Ford Adds April 10	New York March - SHALLER ST					10
nan entral afternal 19 - Sea fang televiset de la sedera de la sectión de la se	100 100	Train Lower Low Low	mgence bearings of tehestate mem- ingency bearings of tehestate devices	10.00				-
Marriel and the Part	11010100000	Armeng with factor	ngerig (dasi, dasi kendi direk Arrige (d Ingerig Taning: H Lak/W) (seri	three #				
e to fronte tear marine traces and tear marine	- i	MP - received on them	Engening Gaunge of Haudiation Intel Printig Physical Darling	100.000		100	-	Alternation of the second s
			Level .	10.000 41.000				
a and a second s	100	A to paget labored entry front, force it around the	data in method and and -	11.109	121211	111111	121211	1111
et Derivative Transpire	URLER .	\$3,064,918,00			URHES /DP	W Trees Link	C bBergelectri	TRA
*3				c	CONSTRUCTION STAT		-	
A Temecula Va	lley	MON	THLY UPDAT		CONSTRUCTION STAP	1T : JUNE 0, 2011		E
TemeculaVa Rospital	lley	MON	THLY UPDAT		CONSTRUCTION STAP	1T : JUNE 0, 2011		E
Temecula Vo Rospital	lley	MON		'E— FE	CONSTRUCTION STAP	17 : JUNE 6, 2011 013		E
Temecula Va BOSPITAL		INSPECTIO		E— FE	BRUARY 2	17 : JUNE 6, 2011 013		<b>E</b>
Temecula Vo BOSPITAL			NS	E— FE	BRUARY 2	17 : JUNE 6, 2011 013		<b>E</b>
Temecula Va ROSPITAL	tas   400 1	INSPECTIO	NS 196400 (60.40000) (196,00) (19	E— FE	BRUARY 2	17 : JUNE 6, 2011 013		<u>nl</u>
ANI + DO + STUDY + ADIUST SAFETY LOG THE STATE SAFETY LOG THE SAFETY LOG THE SAFETY LOG THE SAFETY LOG THE SAFETY LOG	tas   400 1	INSPECTIO	NS 196400 (10.40700) (196,00) (19	E— FE	BRUARY 2	17 : JUNE 6, 2011 013		<u>nl</u>
ANI + DO + STUDY + ADIUST SAFETY LOG THE STATE SAFETY LOG THE SAFETY LOG THE SAFETY LOG THE SAFETY LOG THE SAFETY LOG	tas   400 1	INSPECTIO	NS 196400 (10.40700) (196,00) (19	E— FE	BRUARY 2	17 : JUNE 6, 2011 013		<u>nl</u>
Temecula Va ROSPITAL	tas   400 1	INSPECTIO	NS 196400 (10.40700) (196,00) (19	E— FE	BRUARY 2	17 : JUNE 6, 2011 013		<u>nl</u>
Temecula Va ROSPITAL	tas   400 1	INSPECTIO	NS 196400 (10.40700) (196,00) (19	E— FE	BRUARY 2	17 : JUNE 6, 2011 013		<u>nl</u>
Temecula Va ROSPITAL	tas   400 1	INSPECTIO	NS 196400 (10.40700) (196,00) (19	E— FE	BRUARY 2	17 : JUNE 6, 2011 013		<u>nl</u>
Temecula Va ROSPITAL	tas   400 1	INSPECTIO	NS 196400 (10.40700) (196,00) (19	E— FE	BRUARY 2	17 : JUNE 6, 2011 013		
Temecula Va ROSPITAL	tas   400 1	INSPECTIO	NS 196400 (10.40700) (196,00) (19	E— FE	BRUARY 2	17 : JUNE 6, 2011 013		
Temecula Va ROSPITAL	tas   400 1	INSPECTIO	NS 196400 (10.40700) (196,00) (19	E— FE		17 : JUNE 6, 2011 013		
Temecula Va HOSPITAL	tas   400 1	INSPECTIO	NS 196400 (10.40700) (196,00) (19	E— FE		NT : JUNE 4, 2011		
Temecula Va HOSPITAL	ile Vari	INSPECTIO ance	NS SS A S	E FE		NT : JUNE 4, 2011		
Temecula Va HOSPITAL	te Vari			E FE		NT : JUNE 4, 2011		
Temecula Va HOSPITAL	lle Vari	INSPECTIO		E - FE		NT : JUNE 4, 2011		
HOSPITAL NAM + DO + STUDY + ADAUST SAFETY LOG Manual NUMBER 10 K NAME 2 10 K PPC vs. Baseline Schedu	lle Vari	INSPECTIO		E - FE		NT : JUNE 4, 2011		
Termecula Va HOSPITAL	ie vari ile Vari V	INSPECTIO		E - FE		NT : JUNE 4, 2011		
Consecuta Va Rospital SAFETY LOG Total 1 to 1 SAFETY LOG PPC vs. Baseline Schedu PPC vs. Baseline Schedu Lifet P-t-T-T-T-T- LESSONS L Social data social total tot	in dour alle Vari	INSPECTIO		E - FE		NT : JUNE 4, 2011		
Construction of the second of	in dour alle Vari	INSPECTIO		E-FE		NT : JUNE 4, 2011		
Temecula Va Rospital SAFETY LOG The first set in an set in a set in a set in a set set in a set in a set in a set in a set set in a set in	ini disc ile Vari Vari EARNE Deg And ini disc	INSPECTIO	NS Televice debutter for the second	E-FE		NT : JUNE 4, 2011		



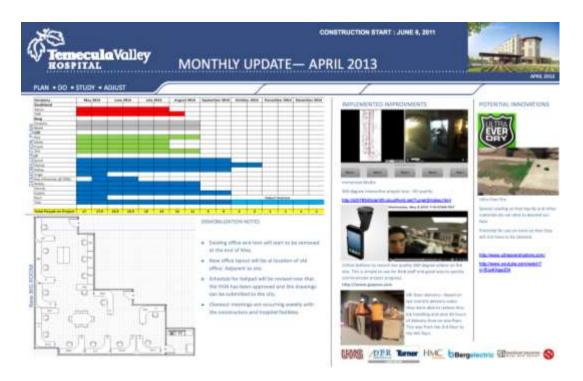
#### 8.1.10 March 2013





#### 8.1.11 April 2013

							CONSTRUCTION	BTART : JUNE	6,2011	100	dim
Temecula	Wa	lley	MC	NTHLY UP	DATE	— A	PRIL 201	3		1	
PLAN + DO + STUDY + AD	TRUM			/	_		/			1	
IUDGET				D BUDGET		10	BILLED TO DA	TE w/ Pre-C	on P		POSITIONS
niger in effective laters			and the second	State of the local division of the local div	- T		The second	- second	C1	event Project Co	ost Carrent Year
80	inter .	100	then the set of the second second	ter initialization from	-	-				1	#118.8.00.001
press and the registered in the failther	100	-	Brinit 8, 1110			12					
and day having and including months.	1	-	may attended	and a local data	1	-	1 m			1000	
and have been to be the test of test of the test of the test of the test of te	1.00	nite ada			1	-				A.214	
A REAL PROPERTY AND A REAL PROPERTY.	100	444	Contract of the	the later of the l	-	100	Contraction of the local division of the loc			1000	and the second
Ten Bed table Renger (AA)-280; Headpage	10	- 100	Minister of the	-	100.010 30.000	and the second			· ·		
A COLO MALLANS ANALASSA ANALASSA		-	All the same	to the tag	10.00	-	and the second	to Date - Mills	- 13		
Children and Announced States	100	- 22	Andrea factoria	Automation (	100,000	-					
and a high patho	100	-	1 THE R P. LEWIS CO.	- Courses	- 100	100100101	CONTRACT V				
same tartage has an internation in contrast of	4,181		AN BUILDING	er Carthogene, Annal I right a fear		-		Andre Andre And	II BARRA		
Non-things into a constant.	1019	-	And Contract Vision	and the second	200			INCOME ADDRESS STOR	100 12224		
chabrais .	-	_	E antie 1 in	of any set of the set	14.00	-		1204 105519 208		A SUPERIOR	
come la ingeneration			fram Sample of	and the second	- 100 PT	100		rigijat njarja rut Loaga (relto ref			
-	-	-	Date for Long	and the second second	46.007			LOURS LITTE UN		1.11	
States of the local division of the local di	18.00	100	T had		Contra Longing			TEME LITTLE LEE		-	and the second se
They write ou Poster (200). • establish acceptant of partie sating as	1.00	100		to Radiant Tra Statem 1954,				010	BAD BURK- N	444	
traction on the strength and the second seco	2.00	101	the second	the second	6.00			11111			-
Resident family by the form some over state.	10	-	Mark Incoming Inc.	and the local days	-	-					-
West Start Street	1.010	400	<ul> <li>A second of the</li> </ul>	And in case of the local division of the loc			1				
AND DID SHITT BE	100	100	MP Forms Finite B/F Forms Finite	ng metaoni, risoring morengo more (sprogr	10.00	IIII				1	8-00-1-0
Nortege Collegent to class so ing	100	- 22	the other thank have	take .	10,000	100					*1000
Ten mellanism caproset	100	- 100	Contract of the		11.00						
	4.041			on Realizative Jack	1.00	-	1212	11122	2222	2222	1111
	16.00		\$5,481.44	in data					10.0		(Characteria)
×9	**		PLACE.				CONSTRUCTION	DER Tarte		Call of the second	aller .
Temecula		lley			DATE		CONSTRUCTION	I START I JUNE			H INC
<i>1</i> 0		lley			DATE	— A	CONSTRUCTION	I START I JUNE			
Temecula Rospital	iVal	lley	мс		DATE		CONSTRUCTION	3	8, 2011		
Temecula Rospital	iVal		MC		_	50	CONSTRUCTION	BTART : JUNE	6, 2011		<u>, I</u> A
Temecula ROSPITAL	iVa wust	lley	MC		DATE	50	CONSTRUCTION	3	6, 2011 		
Temecula ROSPITAL	iVa wust		MC PNSPEC		_	50	CONSTRUCTION	BTART : JUNE	6( 2011)		
AN - DO - STUDY - AD SAFETY LOG	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION	BTART I JUNE	6, 2011 		
AM - DO - STUDY - AD	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & Million HEDULE & Million	BTART : JUNE 3 ESTONES Intel Constants - Con The Constants - Con The Constant - Con	6, 2011 Hereitan Latertauerto Martinaerto		
AN + DO + STUDY + AD SAFETY LOG	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & Million HEDULE & Million	BTART ; JUNE 3 ESTOMES Intel 1	e 6, 2011 , other to to to to to to to to to to to to to t	Annual Comparison of Calification	
AN + DO + STUDY + AD SAFETY LOG	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & Million HEDULE & Million	BTART : JUNE 3 ESTONES Intel Constants - Con The Constants - Con The Constant - Con	6, 2011 Hereitan Latertauerto Martinaerto	Annual Comparison of Calification	
AN + DO + STUDY + AD SAFETY LOG	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & Million HEDULE & Million	START : JUNE 3 ESTONES Intel Constants - Con The Constants - Con The Constant - Con	e, 2011 e, 2011 La Pierre fo Consider a Consider a Consider a	August - Constant - Co	
AN + DO + STUDY + AD SAFETY LOG	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & Million HEDULE & Million	START : JUNE 3 ESTONES Intel Constants - Con The Constants - Con The Constant - Con	e, 2011 e, 2011 La Pierre fo Consider a Consider a Consider a	August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August August	
AN - DO - STUDY - AD SAFETY LOG	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & Million HEDULE & Million	START : JUNE 3 ESTONES Intel Constants - Con The Constants - Con The Constant - Con	e, 2011 e, 2011 La Pierre fo Consider a Consider a Consider a	trans Comparison of A	an analasian a
AN - DO - STUDY - AD SAFETY LOG	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & Million HEDULE & Million	3 ESTORES See 19 Here Constant Pro-	e, 2011 e, 2011 La Pierre fo Consider a Consider a Consider a	trans Comparison of A	All Parameter (d DATA Parameter (d DATA Parameter (d DATA Parameter (d) All Parameter (d) All Parameter (d)
AND TERMECULO ROSPITAL	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & Million HEDULE & Million	START : JUNE 3 ESTONES Intel Constants - Con The Constants - Con The Constant - Con	e, 2011 e, 2011 La Pierre fo Consider a Consider a Consider a	Angel	
AND TERMECULO ROSPITAL	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HETULE & MIL	3 ESTORES See 19 Here Constant Pro-	e, 2011 e, 2011 La Pierre fo Consider a Consider a Consider a	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
AND TERMECULO ROSPITAL	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS	3 ESTONES International Pro- International Pro- Int	6, 2011 Jacobie La Rossi Constante I Constante I Const	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
AND TERMECULO ROSPITAL	t <b>Vo</b> l ₩UST	-	MC			50	CONSTRUCTION PRIL 201 HEDULE & MRI HEDULE & MRI HETU MARY HETU MARY	3 ESTONES International Pro- International Pro- Int	6, 2011 Jacobie La Rossi Constante I Constante I Const	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Co			INSPEC Inspec			50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS	3 ESTONES International Pro- International Pro- Int	6, 2011 Jacobie La Rossi Constante I Constante I Const	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
PIC vs. Baseline Sci 	NUST NUST					50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS	3 ESTONES International Pro- International Pro- Int	6, 2011 Jacobie La Rossi Constante I Constante I Const	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
ROSPITAL PLAN - DO - STUDY - AD SAFETY LOG With m Vitiger Viti	No.					50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS	3 ESTONES International Pro- International Pro- Int	6, 2011 Jacobie La Rossi Constante I Constante I Const	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
PLAN + OC + STUDY + AD SAFETY LOG Termine the study + AD SAFETY LOG Termine the study - AD PPC vs. Baseline Sci Difference the study - AD Difference	No.					50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS	3 ESTONES International Pro- International Pro- Int	6, 2011 Jacobie La Rossi Constante I Constante I Const	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
AN + DO + STUDY + AD HOSPITAL SAFETY LOG The an internet and the assessment of the Content of the assessment of the UESSO	No.		INSPEC			50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS	3 ESTONES International Pro- International Pro- Int	6, 2011 Jacobie La Rossi Constante I Constante I Const	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
Termecula Rospital						50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS	3 ESTONES International Pro- International Pro- Int	6, 2011 Jacobie La Rossi Constante I Constante I Const	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
ARE SPECIAL CONTRACTOR SPECIAL C						50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS HETUL & MARS	3 ESTONES International Pro- International Pro- Int	6, 2011 Jacobie La Rossi Constante I Constante I Const	Annual Compares of Control of Compares of Control of Compares of Control of C	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al
Termecular ROSPITAL						50	CONSTRUCTION PRIL 201 HEDULE & MIL HEDULE & MIL HEDULE & MIL HE HER HE HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER HER	START / JUNE 3 ESTORES June 10 Startes Constant of You With Provide of You With Provid	A, 2011 La Place for Carlied C Carlied C	Annual Compares of	An Andrew Constraints (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All Andrew Constraints) (All All Andrew Constraints) (All All Andrew Constraints) (All All All Andrew Constraints) (All All All All All All All All All Al



### 8.1.12 May 2013

Temecule HOSPITAL	Va	lley		CONSTRUCTION START : JUNE 6, 2011 MONTHLY UPDATE— MAY 2013								
PLAN + DO + STUDY + AD	IUST		1				7			/		
BUDGET		_	-	PATH TO BUDGET			BULCO TO D	ATE w/ Pre-Co		FINANCIAL PO	SIGNICIAL	
					in the second	-		WIE MI HUB-CO	11			
telle Velagios Ren				AP Not live lives		- 241	Talgential .			<b>Clatrent Project Cost</b>	Current Team Pr	
		1000	and the	AD Participal Supervision into the	1.2.1	1000	and a second sec			And the state of t		
inc.	when .	Date: Local	- Los	Af fairing to share being the line of the maintener, industry,		-				1	100.000.001	
California Second and Second Second	-	-	-	"Depity the presting remaining housing teaching (		the second	And Inc.			Addama and	10.00	
angehard .	1000	108		Without and the second se	1417	ince .	Contraction of the local division of the loc			and the second se		
Frankrase Description Desired, manage		1200			1.21	Laure .	10			and the second se	All and a second second	
Coast Earny pro period (unushed No.)	10.000	1.00	10.00	the coupled \$12, bill and an a contract and a contract of the	1.411	10104				and shares and	444	
Fridance Bulley, Drawn for Merchanth-Actival Drawing Wart	ALC: NOT	104		a title to be the title	1.200	inite .				and the second second	and the second se	
CARGO DATINGTON OF STATISTICS.	1.128	804		d low-last to take velocationity	- 21	Dece	and the second second				ALC: NO.	
Penning publicing taking	41.00	100		(2 (and reprint Manufacture))	1.41	(Area)	and the second se			100000		
A first first man impages.	61.004	100		Mittalings on Malans released	10,141	-				about 11	MT AND DATES	
tarii to bhi i kuchar	11,000	4000		10 Contractor in the local data	the set	10,01,14					1.0	
AND DOT TOUCHARD DO DO DO DO DO	41,001	10.00		MM (Norse-Inge	100.000	100.031.000				Company of Company	and the second se	
Address from all P	11,001	104		d Labor Technology Spring) 4 Med Interferonet Second	10.00	10,00,00	and the second second	d to Dete + 80%			-	
<ul> <li>Contracting Age convertion</li> </ul>	41.00	100		#Labore Investories/ty Savinger	into she	SVAN'S	10.00	to the second - and re		and the second s	444	
<ul> <li>demonstrated archest them</li> </ul>	1,68	108		W Roman Science	10,000	104/1 a/100 104/144/100	contribution of the	HILLS PATITAL		1200	and the second second	
togeting the UNIts Allege	4.99	+100		the Address (the local and a description			CONTRACT	VALUE DELTAS		and the second se	2.00.00	
CR/SP 422.38311/18 W Gamelion (Desper (Second))	31,001	. 404	3,00	Without a lost of second processing control process.	100.040	16(14)=	With Instant	Bastarrent Maritt 1 Marith	C Markley L	AND DO		
<ul> <li>Paged report from providence propriete pro-</li> </ul>	4.05	0(4)	4.101	A to target 202,340 instantion in sinte and its rise. News further attack Comparing Instantion of Spring Property.	10,000	00,18/10	had .		1	444444	4.00.00	
<ul> <li>Security Add. 2014 (1998) Interface Conducting Phys.</li> </ul>	10.00	1.81		and a protocol a prior balances.		100/10/100	Bulger Changes	Bulget Bulget Bulget	Orita		1000	
and the second s	10404			Not have not instruction for the second	200	2000	W_NEWP DIA	HARDAN HARDAN DURAN	67 - HEER PR	an and		
				OR Landing to Losting strangents	TRACTOR .	Manager .	W 104566 9516	MORNE ILLERIN ILLERIN	n acter	21.000	100.00	
aver Total (artights)	1910			Trade Condensions, Commission of Advingtor of Agency Amount		-	A stand and setting			and so a second		
includes factorized force	_	_	_	Pages Sources on Thereing Minister Assess Sources on Collection Pages States	10.00	100,000 mil	1 10/07/08 10/065	HINE FARM MICH	0 (26.50)	ALCONOM	-	
				- Address -	11010-001		M LN266 1614	Allmain Granty Manual	E 15.8%	and the second		
		100	times has	And the second s	124.000		# 128.1E 1078	LOUNS LIVER LINES	111300			
	100	Name and	100		ideinte.	and the second					1 m	
President Autoritation (107) alla foi recentrate diversion	188.00	108		And the second s	1.101.000	10100-00	4 19488 6128	UPUR LIGHT LARD	10.40	and the second se		
Ch Taxan de Ho nat (Frances / 10.0)	50,000	100	1.1	And have seen instant the party of the Child				Public in	iak tirigini	Tape. Augit		
Interpretation in these group bits and a second	11.88	408			ine.	inter .						
A Property survey while the element and	0.00	100	1.6	And And And And And	10.000		termine and the second se					
- year and hote characterization in the wing his of	1112	100	1.1	MB. Public London Lange	294,000	1000		100 C				
With an advantage of the face of data and here.	41.00			Methodal Street of Protecting State	-11.700							
Average Content Buarrent	1,141	208		Darm Disponenting Stations, Stating Rooming ;	-	-					Annual Statement of the local division of th	
- neerina har dealor April pacing fort 13 month	11.891	108		Setaining many metallicity and and many			Long Long				Dreese 1001	
A homous week hit;	11.88	100		Days, Nationality, Streets, Proving, Serving 1	11.00	ince .					attached.	
<ul> <li>Applicate wate late</li> </ul>	11.001	1.0	1.1	Mart high age in the head of the second states in the second seco	100,000	-				1	********	
C Derivat GOger/Techning	is ald	108		A softward barrier	10.000						· Protocolasi	
Ch lineer stress	91.00	104		6 lightings of encountermants	10.00	-						
<ul> <li>Not and reasons right sets</li> </ul>	4101			- B Spring of Anic (Manethani)	101.00	more .						
1994 C	140.040	808	1.1	F. Louiseger on Miller Ballages.	10.148	inter 1	1.000					
ANR .	FIMP.	100		Fareh Back Rama, Washington Or Carlor,			1111	111111	44	111111	1.1.5	
	14.84			die base over one				in fact at the	111		(	
and Designing Company	THE R.			55,461,848.00			D CANKE	DPR Tamor	141.40	The state of a state of a	In the Address of the Address of	





Temecula BOSPITAL				MONTHLY UPDA	TE-	- JI	CONSTRUCTION START JUNE 6, 2011 UNE 2013	II.
PLAN - DD - STUDY - ADIUS	ŧ		1				/	/
BUDGET				PATH TO BUDGET			BILLED TO DATE w/ Pre-Cont	FINANCIAL POSITIONS
angli distinguti a dani						1	And and the states of the states	Current Project Cost Current Team I
-	11.1	-	-	E pau Page this lands	-	-	marin.	and the search and the second
-	-	040-000			- 11			THE ADD AND AND ADDRESS OF
				Worng wills				Addate Contract Addate
comment of the part of the par	140		1.04	AP-N/ Saling	- A.L.	but .	Name of Concession, Name o	Contraction of the local division of the loc
Addressed autory and it align	148		0.76	Ethiotal konst lange	1.1	210		ARE ARE
address of the bands	12	- 22 -	- 1-	Winners Lat to implemite proving limiting (States, 2011)		1.00		ARRANGE ARRANGE ARRANGE
AN OT BUILD IN SHORE THE PARTY AND ADDRESS.	1.00	- 74	1.00	A to least Profit watcher to anticadar com-	- 20	in the second		\$4.50E.000
En sular muja	128	and of			- 24			A Designed and the second seco
Contradict of the	11.66		1.14	Team Lines when Lines are provided and teaching of teaching and	100	419431	State of the second sec	And a lot of the lot o
110 (200-00)	1000	Ξ	100	E 18th Material Long-Aurily Addition Auri	100	00011		And the second se
talasi tatan	1444	- 55	1.66		400	100011		and a second sec
and last d	428	100	4.20	Elashama	10.00	1000	and the second second	and the second second
B. Office of states (196)	100						Billad to Date - 82%	And a state of the
and shares and have	18		1.00	New Instructor Listingney Suring of \$102 liver	500	10/031	starts and here here here here here here	AND ADD
and a second second	1.000	- 144		Wheteritlaneumper	Acrit	18/6/31	CONTRACT VALUE DELTAS	and the second sec
Print ment	100	- 22		New Sectories Contaging Strate of Sectorman	10.00	1818/31		And in case of the local division of the loc
Version of the second second second	11.84	- 22 -		Tage Labor or front litera	20.00	1810.71		And
All 21 4 4 complete "prig to include	1.00	1.000					ter faint Toran beint beint beint beint	And Address of the Ad
International states and the state of the st	-10-	. 100		Wang v bel is braine	10/00	10/07/11	A subal size one h has a list of the	
the second se				B instal lan late	344	89611	as said as him many home proved an	ALAR - ALAR
and Reporting to	6.0	_	_	and the second the second second states	100	10/11/1	· Million With Women Straded Wordse all	And a local division of the local division o
and the second				Tear integrar (Sel) Austrian	100	Million .	<ul> <li>TUTUTE PLAN ACTUAL SPACE STREET 11</li> </ul>	
and the second se						- market	a dialos atas stores stores stores sto	
-	-	100	from the	seems .	1004		. The first find the second se	Concession of Co
N ACCOUNTS AND	- 68	1000		- United Intellected and in Classical	1,18,61		I UNIT BUT TANK LINE LINE 40	
Preparet advance in the second second second	14.66		C140	Total .	18.00			Patrice .
	100	- 22	1.1	the second se			same .	
Contract of the second party of the second par	118	- 22 -	- 1	Millione into completion in the field on The spin Court of the	148075	1000	and the second s	
Territori Inference	14/11	- 22	1.18	Test .	100.00			
<ul> <li>Accession and Res and Resign</li> <li>Accession and Res and Res and Res and Res</li> </ul>	- 22	=	1.2	Forth Real Process Statement Transformers, 1970, 1981	10112			and the second se
et avertes	1.04		51¥.		100	-		The second se
- Sept The	148	- 22	1.2	Cast Production (Salar		-8-	terms and the second	Control of
And the second second second	- 224	- 22 -	- 2	Biolog a UT	1.00	100	tion of the local division of the local divi	and the second se
Daries .	10.00	11	11	wintrang.	(14.46)	ine .		and the second sec
No. and the second seco	12	12	0.15	# Volumentary in the second	10,00	100		
<ul> <li>doubles and</li> </ul>	1.00	and it	C Fr	Wang Aren Green Daris Stars (See 201)	100,000	1000		
	6.66		1.8	Kindept 20200 Andress withright and	14.00	ine.	17777777777777	
N 9	100	-	- 17	Party back havin maintaid in Jose-				11111111111
	4.11	-		54,337,288			ACCOUNT OF THE OWNER AND	10 A
contractories integrate	-			and and have			ADDRES / DPR Tarmer HA	Bergelantra: Elethetinter

### 8.1.14 July 2013

No         No<	Temecula Vo	B	sy		MONTHLY UPD	ATE-	- J	ULY 2013		
No         No<	PLAN + DO + STUDY + ADJUST	j.		1						
No         No<	BUDGET				PATH TO BUDGET			BILLED TO DATE w/ Pre-Con	FINANCIAL POSITION	
No         No<						1000	-	factor for preta and a stat open		
M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M         M				-	The low residence have been been been	_	1.1	Station and State	annual collect start	
Notice for a first integrating type (not in	-		-						1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Notice interpretation provide and the interpretation of the interpretat	1957 11		-						ALC: NO.	
at output         State (see (see (see (see (see (see (see (s						-			and the second s	
Bit is in the server for a long second data set in the second data set in the second data set is in the s	R and a long of the long way way but		1.00	-						
Million Reserver     Low W     Low W     Reserver     Res					<ul> <li>Insection of the sector of the</li></ul>				And a local division of the local division o	
Nome         Nome <th< td=""><td>sile obtained langest field.</td><td></td><td>1.6</td><td>100</td><td>a national</td><td>678</td><td>100</td><td></td><td>And the Party of t</td></th<>	sile obtained langest field.		1.6	100	a national	678	100		And the Party of t	
A Very Inn.         Los No.         Mark Instant					Elanhame	2.5	100			
No. 1         No. 1 <th< td=""><td></td><td></td><td></td><td></td><td>Magnistran</td><td></td><td>and other</td><td></td><td>The second secon</td></th<>					Magnistran		and other		The second secon	
No.         No. <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1.000 A.000</td>									1.000 A.000	
4 cm         2 m         6 m         2 m         6 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m         2 m <td></td> <td></td> <td></td> <td></td> <td>and the second sec</td> <td></td> <td></td> <td></td> <td></td>					and the second sec					
N.W. Invest     S.R. 100 (a)     M.S. 100 (a)     M.S. 100 (a)     CONTRACT VALUE DELTAS     M.S. 100 (a)     M.S. 100 (a)       2.00 or 100 (a)     2.00 or 10     3.00 (a)     3.00 (a) <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>and the second s</td>									and the second s	
N.º. Entroom     Link or op     Link op <thlink o<="" td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></thlink>										
1 + Normaliji     2.20     4.01     Earle Earle Marging     4.01     1000       2 + Normaliji     2.00     4.01     Earle Earle Marging     4.01     1000       2 + Normaliji     2.00     4.01     Earle Earle Marging     4.01     1000       2 + Normaliji     2.00     4.01     Earle Earle Marging     4.01     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000     1000 <t< td=""><td></td><td></td><td></td><td></td><td>A R Card Witner</td><td></td><td>300</td><td>CONTRACT VALUE DELTAS</td><td></td></t<>					A R Card Witner		300	CONTRACT VALUE DELTAS		
Link         Link <thlink< th="">         Link         Link         <thl< td=""><td></td><td></td><td></td><td></td><td>Lashenicare</td><td>4,8</td><td>803</td><td></td><td>A REAL PROPERTY AND A REAL</td></thl<></thlink<>					Lashenicare	4,8	803		A REAL PROPERTY AND A REAL	
International conservation and provide and				104	United Sectors	58	10.1	The PL Amont Annual and any An		
Species         Allow         Processor (2000)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10) <th(10)< th=""> <th(10)< th=""> <th(10)< td="" th<=""><td></td><td></td><td></td><td>104</td><td>#Total histories</td><td>3.8</td><td>100</td><td>Auge lings hepr high bege b</td><td>A</td></th(10)<></th(10)<></th(10)<>				104	#Total histories	3.8	100	Auge lings hepr high bege b	A	
Upwer begins fragen         NATE         National control (n)         100         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200         200	See.		**					a land the same state taken a		
Monetidgeties         Marging/Softwills         Marging/Softwill         Marging/Softwil	(and high ladiges		-					· ADA KA ANA LTH LINE		
Margin Joshimi Lin         Lin <th cols<="" td=""><td></td><td>_</td><td>-</td><td>_</td><td></td><td></td><td></td><td>I LOR HAR KING DAMA HARM D</td><td></td></th>	<td></td> <td>_</td> <td>-</td> <td>_</td> <td></td> <td></td> <td></td> <td>I LOR HAR KING DAMA HARM D</td> <td></td>		_	-	_				I LOR HAR KING DAMA HARM D	
Image: Control (Control (Contro) (Contro) (Control (Contro) (Control (Contro) (Contro) (Contro) (					Made Sciences		100	W total has the ATCH AND AND A		
Normal         Normal<	( ) + S		140	in the				# 1012 GA 1218 1842 1965 4	and the second sec	
Adversion         Life         B         B         Bits the appropriate alregation (i.e.) (with the appropr	-	-	Inc. in	100	ARRY MARKING AND CAMP			· THE LA THE LAST LAST		
6 discussion         Life         Normal         I and the support of the su	5-mail:01	118	19	1	14	10,00		The set of	and there must	
A formula         10         0         1         M         DDM         To           60 forsy whitesing         10         0         1         M         DDM         To           60 forsy whitesing         10         0         1         Mode transition that and the foreit transition to the foreit transit to the foreit transit to the foreit transit to t	6 ditatente	140		1	and a second sec	-	1			
Bit Name         Dist         N         Dist         N           Mill Name         Dist         I         No         Dist         I           Mill Name         Dist         I         No         Dist         I         No           Mill Name         Dist         I         No         Dist         I         No         Dist           Mill Name         Dist         I         No         Dist         No         Dist         No         Dist           Mill Name         Dist         Dist         I         No         Dist         Dis         Dis         Dist	R. Austriana	205	- 10	1				termine and the second s		
With With State         Dis Official         Image State         Distribution State         Distreacoon State         Distreacoon State	MP destarily work and any			1.00	18	1248		the second se	and the second se	
Bit Indexesting Theorem     Diff (i)     Fill from their transmission       Difference     II     II       Difference     III     III       Difference     III     III       Difference     III     IIII       Difference     IIII     IIII       Difference     IIII     IIIII       Difference     IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII			100	1.1					Frile.	
Theorem         IP         IP <t< td=""><td>AP had resident that return</td><td></td><td></td><td>1.1</td><td>And and Anna Station, And Street, 1981, 681</td><td></td><td></td><td></td><td></td></t<>	AP had resident that return			1.1	And and Anna Station, And Street, 1981, 681					
# sambarachi         48         60         1         Melanetrizapping/2021         38         39            # dathigrandi         10         00         1         Melanetrizapping/2021         38             # dathigrandi         10         00         1         Melanetrizapping/2021         38             1 dathigrandi         00         00         1         train texture for two         48         He	(Teamwige)			1.1	become the family of	1.0	1.04			
Participant di di 1 Malantifiquita figural II de Tableconas di di 1 Malantifiquita figural	# instituted		-	1.1						
Laberhanse of the Constant service in a serv			100							
	Labrehranse			1						
	whi	2.0	-	-	04,827,288			1111111111111	11111111111	
instanticity to Bills / 022 Tener Hull Despitetive Stat	100000	-			Philade Same			ATANE AND THE LO	Che Roma	

# 8.1.15 August 2013

Temecula W	alley	MONTHLY UPD		GUST 2013		Л
PLAN + DO + STUDY + ADAUS	n -					Aget2
BUDGET		PATH TO BUDGET	84	LLED TO DATE W/ Pre-	Con FINANCIAL P	OSITIONS
		larbe for	100 M		Current Project Car	d Current Team Pr
-	in the later	a a construction of the second	1 30			
Film active cartierizes	18 . 19	THE A providence to take	1 34		-	COLUMN TO A
E lacinguist	320 08	Litt # hearing	1 . M.			and the second se
1. William Int	18 19	Catcheres Earlier and	1 30			Contraction of the local division of the loc
ST-Taris	10 10	THE REPORTED	1 24			
( Facally	12 18	18 Augustation	3 38			
1-Bellaver Minu	28 10	2 Advertising	0 24			
1.Kar	18 .00	(2) Winschrücklung	8 288			and the second
#2 normon	10 10	28 Ministracian	1 hn			100
Administration (Cartor	10.00	in addression	54 853	Edited to Data - NES		4444
(F-dum-hells	10 10	ta Lansening	438 813	TOTAL OF PARTY AND		
- electrocrack for lands	12 18	a new laws	A6 903 CC	INTRACT VALUE DELT	15	
V S lottle enter of here we have	120 100	1 mageorade			and the second se	
ALL ADDRESS OF	ALTER 11.	Contraction of the	10 000 10	Anter Till Agrost Stream Till Soll	April Barry and and and	
	(14) = (	UR selected and	3.0 1.0.1	hay hay hay hay	April 20 House Street	1000
Line monor this sector P	Set 2	10 ms	108 0.41	THE CONSERNED		
	11.7	and an and an and and	1202	ADD DA AND LOD		
- I M	9.0	1	100	LOUN THE LINE DAY		-
antiquitys .	- the		and and	a conte das come conte		
Right and	1.0	When you applied on the activates only	287.001			Concession of the local division of the loca
Interface and a second s		-		the set of the set	Till Sam Frank	1000
and adding		Appl Add Assos Realized Tex Marth D. A.A. 107			The same rate	
	-	Barrie 7 the interchang in contractor				
		· energient of all one	10.00	and the second se		
	34110	W N-resolutions	100			
9-metrill	18 14	All appropriate the second sec				
S-industry	12 10	The second secon				and the second second
# april 0	32 8	R House Party lang	5.6			
# lacel local When binas	10 19	<ul> <li>White the second se second second sec</li></ul>	5.0			
and .	8.0	Auto Santa Santa Santa Santa Santa				6 A A A
united states	**			erererri	-	1.1.1
2 - C 2 - 1		\$8,079,523		areast with a	10.0	
Wightubel)				UCE /DPK ME	or HVC bergelectri	Think and search in

# 8.1.16 September 2013

Temecule	aVo	lley		MONTHLY UPDA	TE-	- s	EPTEMBER 2013		л
PLAN + DO + STUDY + A	ONIST		1				/		
BUDGET				PATH TO BUDGET			BILLED TO DATE w/ Pre-Con	FINANCIAL PO	SITIONS
(mign funding may from )				_	-	-	DILLES IS BUILD BY THE SEAL	Current Project Cost	Current Team Pro
				1-Du Renal and an initial subst	1	100		and the first state	the second second second
-	-	- 196	Spectra	· hardenstationale	1.1	100	The second se		10.00 C
	_	law be	14	-2 hantstop	- 1			and a second sec	-
B Mildle ballingene on part tool		200	1.1	4 up Table					
Specie and result for says lighters.	1,00	1.0	1.00	Walson Determine	1.1	-	10 CO 10 CO	and the second se	And and
# los/bas/64	1.86	104	185	Tage Incident From Table	- 61	- 21	the second se	and the second s	
A/W faile tel	1.000	4.8		Name and allow	1.1	- 21		And the second s	And a local division of the local division o
N/W OTOHOME	2.8	100	1.8	Rivers' Sectors		-		T passes and the	
1 Plancing	1.00	88	2.85	# hd ad ht up from	1.1	-		and a second second	
A M/S Hardson	3,60	530	1.00	# holdstarters		-			A COLOR
N/W Herid, and the tripped				Additional Street	- 61			and the second s	And a second sec
ang musical data	1.40	- 19		Kindar Latronia		- 21	Differed to Casto - 27%	and the second sec	
10/17 idd part that informers	128	100	106	Wang-G. Tappin		- 22			1000
# help the 'if go a right	10.00	104	1.00	East Training	-	- 22	CONTRACT VALUE DELTAS		damage and
1-intervertighter	1.00	100		Cheve (participant)	10.00	-		and the second s	
AVUM emcluberiescon	1,100	100	2.00		100		Tarment PE Agent Scottle agit 197	BAR COLUMN	2000
ATUMOR Degraduated by Tumo				The bearing and		-	has then had been had	040	2-000
told many advection and	10.00	104	18.1	Service contractor	308	10.074	# NAME TEA 181% ER20 E427		
R. Kimati Addressing in Salar	8.25	100	8.77	Man State of Local Toward	10.00		· JULE DA LAN LAN LAN LAN	and a summary second	
Sales and the second se	10.00				1000		I. STAT THE MAR SHOT DRY	the state of the s	-
and the second se	-			*	1.00.00		# 100m MM 100M 20108 10107	and shares and	
Land begrindigning	2040			Window applement of the second state	1000	10000	# LOCAL AN LOOM SHOT CARD		6 N N
Discignists Senttli	- 64			-	1000		· THE CA LOS LOUP LIES		
Controller Deligence See				that due have balance the black - Sold Pol			further for the second s	Dearty Search and	
		456	distant in	antilizer ident		-		to Same Praffs	
be .	. take	Dane Box		Them in the second		1000			
AN -termination	1.10	100		Wang to 1. Watering		10.00	and the second s		
						-			
At invalve dealing	418	125					i		
A desired at	2,00	1.N	. 8				·		22100
Settore .	2.80			Path Back tems Resilied to Date					and the second
Service and a Colleges	1.00			\$8,335,376				11221222	
Dista Ingential as Tament 12							11111111111	111111111	
							UNE APER Terrer	IVC bBergelactric	S

# 8.1.17 October 2013

Temecula Vo	11	y		MONTHLY UPDA	TE-	- 0	OCTOBER	201	3			A.
FUAN + DD + STUDY + ADJUST		3	1	/			/	-		_	1	
BUDGET	_	_	-	PATH TO BUDGET	_	_	BILLED TO DA	TF w/	Pro-Cor		FINANCIAL P	OSITIONS
Inder Services and				And the second second second	104	1.000	The second second	units of the second	1.11.10.000		Current Project Cos	
				Sectoring in Concession in the Carlot Sec.	- 1	b.e	Avg. Part	-			And the Longitude and	
	-		14			-	1	N =			une C	178.434.007
President and an inclusion of the second second	18	100	10	M. Account dispersion over setting	- 1	in the second					Contraction of the local division of the loc	and the second sec
A faelaur En	38	10	34	# Superstates	- 1	1.64					and the second se	DECK MARKE
ST# Barrier	18	108	17	E-uni-function		1.64					ADDA DO	488
N/P-IR had be	14	100	1.06	Wanyo Late angle	- 14	ke.	No.		100		1000	-
C # C - out have	18	18	1.0	beeines a field face		ber .					and a state of the	
The second second state of the second s	1.00	10	- 7	Parantest (editor)		319					and the second se	
B Turbelle Trans Inda	10	10	1.84	Bineter Invitates		hes.	h				And Person in Concession, Name	
- Manual State	3.01	100	- 1	Wite all branches							and the second s	
at the and Disaster as	16	406	1.00	Wheels Landson			Wited	to Date -	100		and the second s	
in facto so the free first structure	14	100	- 1	E 11 June 1 al a series		Rea.					and the second s	444
VY descents when	100	10	10	Farry C. Testing		122	CONTRACT V	ALUE 1	DELTAS		and the second se	
RT Location	48	18	18	Finese Section		1.64					And in case of the local division of the loc	
Million and Ann	100	10		Blackmanning.	- 10	1000	tardels TE Intel	Detail 7.2	NUT ALL	Rently.	And State of	100
PA malaineneen rondinas	108	10	100	Haussiantinetian	2.6	10160	high lines	hiter .	her her	- Info	And and a second se	1000
in Allowants	28	106	- 24	Second Stratig	3.8	1000	# 14716 2128	1000	MINUT TIME?	100		
Rightman Antonio and a finite Lancest and the Base	10.	100	40	linia	11.0		# 166186 1818	2,25,66	CHARACE LEARNING		and the second division of the second divisio	and the second second
Lana .	11.84		_	Sandhause Basiciliayer	0812		1 10408 3140	10.00	THUR DOLL	-4116	4444	and the second s
1.2.00				1#	- 100		8 1016 106	1248	11000 11100		And a local division of the local division o	
participant and a second s	3.86			WE have not a second and an exception of the second as	LINER	1011	# 12570 KP	101106	LABOR VALUE		Anna	A
Management or Survey Mill				See .	1/828		# 1440 LN	104.04	MANY AND ADDRESS	1.146		
teacter priget for				And Add Apon Builded Top States - 1981 (1981)			100 - Contra 100				Torr Anth.	Ingen-Togri Hullt
	-	. 16	-	Flavid licenses	1 38	1	(			et then		
States in set 2	2.46	100	- 10	Committee in some	1.000				1.000	-	and the local data	100
M farm to make an an	- 67	- 2-	-1								0.00	
B backsing in a line	140	1.0	1	and a market of the second second	120.00		10.0					
1 histories	100	18	1	Path Back Items Realized to	Date.							Manufacture of Control
A decision	100	19	1	server construction of the same server			-		-	-		Provide and Acceleration
Lange (	54			A RECEIPTION OF				-				
the bands to the t	1.0			\$8,655,376				135	1110	12	117111	1111
No specific a facet (								100		100		

### 8.1.18 November 2013

....

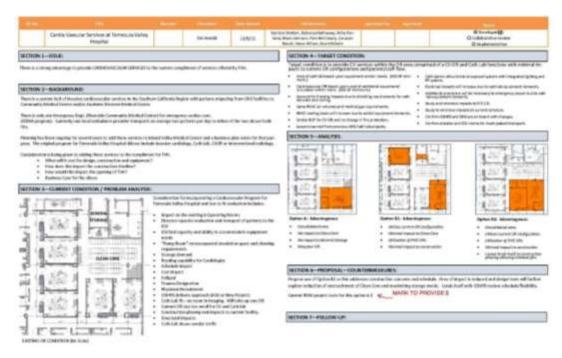
TemeculaVe HOSPITAL	alle	y		MONTHLY UPDA	TE-	- N	ovember 20			<u>III</u>
PLAN + DO + STUDY + ADJUST	7		/	/			/		/	
BUDGET				PATH TO BUDGET			BILLED TO DATE W/	Pre-Con	FINANCIAL PO	SITIONS
age for large to the				New Costs and Destination Reference (UVC) Ref	11	he	(milting	A THE CHEEK	Carrent Project Cost	Current Tours Pr
-	w	1X Inte		New Connected Sectors in the Article and A		10.00			ALADA A	
Number of the state of the stat	1	5	1	P house beg	1	he.			ADDING NO	08.000
(# Election		8		1 sectors		. 80			in the second	100
OP/1-weiline	128	- 50	10	Neeprosee		he.	No. of Concession, Name		12.00.0	-Address
Description .	238	. 61	- 1	Set brow of weathers A long with we finally of		20			1100	-
when we the stand has a first service of w	738	- 08	1	Miniafarian		124			23-00-0	A60.
A provide state	128		1	Winterformations	- 2-	1.64	Milled to Dame -	98%	ALMON TO A	A100
er falle far	18		28	Www.bistatavia	1	24	CONTRACT VALUE D	STITES .	41.00.0	A10.0
Wood Industry v Nite Lines of Intellige	12	- 10	12	Attitumateters	1	3.0	CONTRACT VALUE L	PELIAS	ALC: NO.	1000
Per l	363	-		N feature Containmente		.34	Test Banker PET Agreed Romat PET	ME BUD MAD	ala da	100
				Makes 2. Hearing		-85	Mar Deer Mar	Reigel Builet Side	25,000	100
or Ne Lolge	30			Elizoia col lete leve	10	100	# 34540 Hall 30874 3	URLE LURLE I	10.00	-49.44
Alignetia livet2 velute lineges, ten	88			New Jong on Cliff New York	108	4301	<ul> <li>BTUTE BIRL SUPLAY IN</li> <li>BT SIGNE BURL SUPLAY IN</li> <li>BT SIGNE BURL SUPLAY IN</li> </ul>	10140 1.0120 140 1.0140 11.0100 1 20121 1.0120 1	and and	
				Antipachanan in Blogin Kingrat	-058		w child the beam a	17119 17119 1		
-		w.	. 10	<b>W</b>	UNIO			met levis braid		
in the local day	-	2.2	Dearth D1	-Approximent and a second seco		211	and a second sec	1111 104	Po Polylin	
d'anne enderstant		10		Net And Anna Ramon The Manuel - B1	<b>MADE</b>			1.4.4	-	-
W Review Later (and 1) at		10	- 21	A 1 Mar of a 1 Mar and a 1 Mar and a 1						Sinter-col
R-Metarial		28	100	Path Back Itamis Realized to Oate			1			Statement and
AND CONTRACTOR OF		1.14		Parts back marts featured to pare				-		Billion in the
verbeue beges										
We hagened as Lower (2).		1		\$8,655,376			11211111	111111	11111111	111

### 8.1.19 December 2013

Kit charts II	MATH TO BUDGET     #Files     Theritage And Statution There is a second to a statution the     for the second to a statution the     model of the second term of the second term of the     model of the second term of term of the second term of the second term of the second t			FINANCIAL POSITIONS Derest Prival Cele Rest Pri
bi Ba S Manuschen ist an interest ihrer Turkan kom S V (* 1)=01 Ki Ke forsten interest insportweiten Ser fortein Ser fortein Ser Ser Ser Ser Ser Ser Ser Ser	Testinuk ko Konserino meter Kons Aspeksin III. Konserino meter Konserino III. Konserino meter Konserino III. Mercensi Internet Konserino Mercensi Internet Konserino Mercensi III. Mercensi IIII. Mercensi IIII. Mercensi III. Mercensi IIII.			
V Hanna Union of Energi Service Visitan Even Visit Open Service Servic	Beneficial and the Color Internation     Include The sector Sector Sector Internation     Include The sector Sector Internation     Beneficial Sector Internation     Beneficial Sector Internation     Beneficial Sector Internation     Provide			
V Hanna Union of Energi Service Visitan Even Visit Open Service Servic	Incard Eliferation Englands     Werkensbergeham     Werkensbergeham     Werkensbergeham     Songerstein Elifere     Songersteine     Songersteine Elifere     Songersteine     Songersteine	11111111111		
CR: of Space (Section Section	Bit         Bit           Bit         Marchines (notice from the set of the	1111111111		
CR: of Space (Section Section	Beneric Internetion 2009     Beneric Internetion 2009     Beneric Internetion 2009     Beneric Internetion     Beneric Internet	TTTTTTTT		
ier Technise in Christe (Christen (Christen)) (Christen) Processer and Christen (Christen) (Christen) Her Schröchten (Christen)	If the Neuroiman of Article All     Week Stream States of Article All     Provide Article All	TTTTTT		
Politicaria data da activitación da activitaci	10 Northeast Control     10 Northeast Control     10 Northeast Control     10 Northeast Control     10 Northeast			
an Life Kalandari II. 1997 - Balandari Balandari II. Indigen clandari Indigen clandari II.	10 A Australian Labrata Marcular and Marcular Autor Marcular Autor Resultation Marcular Autor	11111		
en Dit enthyldige Bit Intgensland 1 Intgensland 1	Lan Sana Kang Cana and Sana Cana Cana Kang Cana Cana Kang Cana Cana Kang Cana Cana Kang Cana Cana	1111		
erite inter Rigescient 1	Spring of Articles Planet Articles River and Articles Water and Articles	11111	CONTRACT VALUE DELTAS	A0000
algenciest 7	Energy benchman Elevent Marchan Warren Damar beta	1111	CONTRACT VALUE DELTAS	
	Risearianian Wax-arisea	- to	CONTRACT VALUE DELTAS	
	Wincollouse into	1 10		40000 mm
				and an other design of the local division of
		1 64	Taribase PE Spree Deservity Sold Sold Red	Contraction of the local division of the loc
	a kittaniwan		The real line has been been been	1000
	Fater on other			10.00 million - 40.00 million
Witerstattik 21	W Find Ultrain	1 84	I DON THE ADDR AND ADDR OF	a and a second s
t martin and	as Unoncordateless	1 64	# line ser line som plan i	
	Minu Minut	au state	# 10.10 404 1018 1888 1880 1	
		100	A 140 CB 110 100 100 10	Part make lines in our starts
verlande lange 54	Special and Warth Warth	1001		
Mignister!			100.0	an in the
	-	16.8		
	Path Rack Institu Readows Fills March - Gill, 201		the second	and the second sec
-	A CONTRACTOR OF THE PARTY OF		1	Stream and a
and the second second	Puth Back mens Realized to Date		the second se	Balance Processor
THE REAL PROPERTY.	a state of the second se		and the second se	Province -
CONTRACTOR OF THE OWNER.	*)		the second se	
APPENDIAL ACCOUNTS OF A	58.750.376		41111111111111111	

### 8.2 Sample A3 Documents

### 8.2.1 Cardio Vascular Services at Temecula Valley



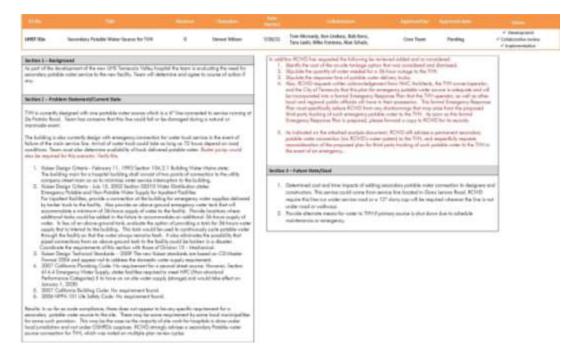
### 8.2.2 Developing Paths of Travel to ICUs that are Acceptable to Licensing and OSHPD

Bit Designing with different of the set of t	non, Sange Tragellas, San Mino, Ania Sanati Disponsional Disponsional
aciest-Melganil	PLAN B1 Datiture (C/) Listaner 3 Sunt.
And 1 - Name A summer Control Late     And 1 - Name A summer Control Late     And 2 - Name A summer Contrel Late     And 2 - Name A summer Contrel Late     And 2 - Name	Prv • summer in Mag dage & BY • Summer in Mag dage & BY · Burnery • Rest • Rest
Berland House Specified Response (The cell of the end of the end of the test	Where a pocker of the 2 rd flow by F-P to provide separate access to ICU's, 3F economic range and - for accor.
Second-Angen Anten • 2017 Sciencesh T21 In produkt state An	prize (D)
c (1802 m.g. units 122 control references and 1 m.g. units and 1 m.g.	First         Status         Status           1         Overge contained is 1 ^{rde} bar?         Status         Status           2         Contract contained is 1 ^{rde} bar?         Status         Status         Status           3         Concern contained is 1 ^{rde} bar?         Status         Status </td
<ol> <li>Wite the control of the bits and an index the control on the control or while to the paths account the meth TOT and the three channes.</li> <li>Opening the rest DOT to the bits active three channess." For an adhed by path and the TOT."</li> <li>Opening the three channess and the channess of the control of the channes and the channes are the channess three channess and the channess and the channess and the channess are the channess to the channess of the control of the control</li></ol>	

### 8.2.3 Modular OR Ceilings

***	Real Provide P	feetan.	Centre	-	- Colorano		-	Agreed to be	and a
401104	Makan Di Salinge	3	for thirds	300.00	Boot In, Nerth, Maid T, 26 George T.	ne Hy, Olever Y.	100 Jane, 60	9xx 01,000	A Destruction A Colorente Contro V September
Section 5 - Reciptor	ad .			Section 4	- Assetgate				
the protection, Targe	inge om Hengend verfinellt och fredstand i of Recent, Instal Atalis, and dispatel, parti- ation och rectligte tinge och hade specia	e and had proved		intege .	Advectory in the line of same load and free fitness	carte ecoletipes	Par Anthro San Brancis	ing His scaps ray for both process Roman Contrapositions and do Official and	An Mark Hall Resp. of Proce to Support Andro- et and a souther and testade is not provide any savings for
Conserving, the Official Reprodet, and conserva- source to many char Conservational Conservational Proceedings Proceedings The construct The construct	Hallwood (Tarena) false fings on Taring, Angreef for Walliansi on A al shall be based and other applement app Rauge for the wave: strainard band, and random and tarena applement and all band, and and a strainard or all find of the ML find of the ML strainard applement on the singular and strainard of damps and manates the singular and so the single, an addression and strainard or all the single, an addression and strainard or all the single of the single single single of the single single single single single single of the single single singl	gari. Sili outbol kr spanikgis teke (No socii a tie kili) kiel konstielge of the r felti is accorrected	halding (Hoalings alling word to be requipment to be to that appipment		An a procession of which the PCA balance with ends the latter balance to any the state with ends the state many the latter with end these state and the latter with end these state and the latter with the state with the main the latter with the main the latter with the state balance and the latter with the state with with the st	(1945) Mill southeling / di La fair saidty, quita faiture diargen to southe Nama i In Malandi Son pod maganetic fai	And all because scorely descent descent descent that had	darlar is the property well's contracted to be the former concernity	al das 100 perso In andel Vig, Indonge (prime) dass unger (Sachadary (A. 2011) et allered
	legy is required. Anglis satisfication for one statistication of 100 code	and the state of t	in state which have		item .	Lietta ta Lite	AN SON JAK	fored At Madule: CH Lo	dings Counget
	there is hyperadly setting or work in the field.				14.6c			A. 411,084	
	in terrori 1 de pourde finisate responsant contamiror tals		Active set for 1		Ebritical			314	
	scholus rispairs and in-auth price to assign				10000			0.00.000	
	other read to additional percently as they				Mari Gue			84	
	tatis of incomes, the start part dynamic 100 and				Paint			112.000	
	mant for officing working and he lakes				76.5			11.445	
	an install on the critical part - service		of a state in sector 1					A STATE AND A STATE OF	PY
	and the second sec		Constraint and a		Averitari Minifalar Dropm			\$3.77.08B8	100
Inclusion & - Pathane M	and the state of t				Design (Duringe			MALENS TA-LINE	80
	Contraction of the second s				School de Gautege			Lacours .	and the second second
the build and an and the second second	of per-manufactured, mailting withing	-		1	Tubb	HALF COLOR, MUSIC	(writigs in cast	and if service charity w	No. Post in the state of a
	apportantly to more the spellin of		and the second sec	Section 5	- Hugesd				
fre als Billifailles, I fearst (Aatiges, alsh prooffie (Aut Pile res Accelera (Amana)	er Chroning, Bradalfy for Litan responses Parjaristishedde. It is mine alternative reduces the later stitler in the Teck, and provide the	_	191	. 1	land on the Analysis, the team of Antoine CR system To keyer with unfolgencie-with So – Fallers an				fer denge verformelikation of th
Consistent sugging	sjelt, Logiligt en Florg tjern ogenditer af Nik profest - Nordfan for nandechand, nordaler offing symetry to onderend, nordaler offing symetry	and and	- A weeks	Allesson Mission Mission	entrant rend at each of design - ay antique Mold duradium of constitu- to Corre Taxon effer testad to corre 1 also assess from an agentificar	eldent - gibele for assesse perhaa	to - charly 113 ml		

#### 8.2.4 Secondary Portable Water Source for TVH



#### 8.2.5 Select the Supply Chain Methodology for TVH

							127			
	et Re Tagely Clair Weltschilige for 747		Also Tanko	MIND	New Root, Lens Infraser, Dan Histor, Tanishe UKCariby, Noli Charolan, Ciroly South, NoliCalita	8			d Desirgues D Desirgues D regioneratio	ine '
Tabl and drogen 4	1997 Mali on Long and Allendard I ad anti-all of the biset of body to a spectra the set	* "LAA IN SHOP" I	were class method	hings Teld.In	Context - Supriculture	Desired Schure areas - a	far-sailte	second.	Contraction State State State State	(from a
Conference with the bragital address on providers with Tana frameboly an oble	med (decidence a constant dat) gen and a 1000 to long developing a tra- factoria. For scalar prostations are studied when they may be an and a long to scalar short they may be assumed with both foundation are constant of the contract of the following and areas collowed.	in Dane Kital 12 R. and at the sail	1971). Net parts o to fina i) flats wit	ent adaptively 1) for the black aminan						
<ul> <li>Belbe Wei</li> <li>Belbe Wei</li> <li>Dedir Hat</li> <li>Dedir Hat</li> <li>Dedir Hat</li> <li>Dedir Hat</li> <li>Dedir Hat</li> <li>Secondate</li> </ul>	rinden her Tell in nationale flowig) for Talls installing of samp partners Matterner perspectivelik insentiery des Ner (20) in anende Jagenspelale continuels auf droppetel fackwissen for source, and obd				Serbini 6 - Proposel - Daniel	nasan (Abilio	0.704	ter V dir o	en not opt weber)	
	TAN weather in other UNIC/Incole Carel Marget	10.0			Section 7 - Implementation 7	Nen (läns die antersch	n through	ingilation	rames)	
Index 7 - Karnel	faulter (the logare on first, for	e a panel Disgo	- rest Tablers	e atil offend			-	Set:	Stiew Genet	None -
Langethia	n dan mentata at ¹ 00 katikan ant at 100	Saltini altin	Na California Regio		1 1 1 1 1 1 1 1 1 1 1 1 1 1					
Section 6 - Prolition	Indiate (The scheme young petition)	ness and the PA	Parts to serve	-11						
					limit Test Ayland offer Depice	ntelan		Contine	wit/wait Infactors	
					factor i fulin g fad	hapisment (pite ) /	94, Da. 70	4.40	er (1966 )	
					ł					

### 8.2.6 Selecting Location of Hand Wash Sink at Med/Surg Patient Room

***	Saturating Insultant (Planet mark drift of Midd)) og addete some	A Annual Annual Annual	tirer-Register	Farburt, Roberts Harlpoorp Liter Literation, Lee Textgens, and Million		Millioningeren Millioningeren Umgehenningen	
Barriso 2 - Ball Nacional Jonation	de Next 12 method with distance in the local beaution for	The local had based und in such Multine /	Bacillos & c Analysis The system and protect	outras esclusi			
Contractions - Contractions	effectives and a set of the second is a second strategy of the second is a second strategy of the second is a second strategy of the seco			稻梅	64	74	64
	i paud americ el sancting Decame Arguns diad ha previliad in the pallacit costs		L INNAARD TO	3000001	1000001	1 Martines	1000
Sector 2 - Frei	ine Manageri, Karwari Mata						
-	Madee		A. MILAI (SHORE	Antonio Science de la composición de la composic	Andrew Print and Andrew Print	Ampter-Interim	Second Street Street
- Antigenet Flater Freed	Isona's parts of an energisating the same (possible) to and (programme) with transformating distance restauron state of Gamp. (Education restauron and provided and provided and PE (particular and action of Gamp).		5. MINH THE MILLION THE MILLION THE	140	10	**	14
and after re - PRC heres	a allo officializza control (divinal practices and proceedures, reporting RFS) includes: glower, result; all'increases colls have investing;	Inspeces of Langel III prior to participation (PRI)	-	10-00	10.000	17.00	11.00
Case have 3. (central result "See have	ulateres increases nuns officeres patient had also religions nunsaes nuns officieres		5. month10	No.	these art of a signed 0	Marin with print size	Name of the second seco
- Solo Canada A. Manenal Cineses - Cinesesanti	ital solit ingeler er deta etima antikete gant for solitagen variet di solari ani sasa filma erigi salahgi ost	(and (the second se	4.265-1221			-	-
the second	of Markel' required at Form approach, man 10° union in regional priority of store (reserving leavings of store and		Tool and up to two	n had only (scatters ) of 4)	wati le an Elifordi		
<ul> <li>Null insur</li> </ul>	el a. In counter		Inclusion - Property -				
			We recommend a joint		a secondari will a Dicherge in deal triamer and Disland of		
			Inclusion - Pallers and				
Setter 8- Rea	en Trans, George		and the particular of the part				
	a scientister ab all reports and Constitutions of Taity/Andriens contact in the fact and scient of the science's records	8					

### 8.2.7 Selecting the Optimal ICU Patient Room Layout

· · · · · · · · · · · · · · · · · · ·	fathering fact	anna kana timer keng Adaman gelanggina, kan kekang Jak geng Tempi Ken	Extended Extended	a.m.
brink 1 Subgrand	factor 4 - Available			
The efficiency of the foreign device is a set of the set of space of CL Texes from the set of device for and the set of efficiency of the CL Texes from the set of device for and the set of the set of the CL Texes for a set of the set of the CL TEXES of the method for a local device result. At method we have a set of the CL TEXES of the device of the set of the CL TEXES of the DEVICE of the set of the DEVICE of the set of th		705	105	
Last their & Australianty Part of South Head South Off 202 204 (01.1) And reacted Selectors			47.1	107.1
All nacional Internets & Descalar Internet Antinez, Julyai Rachiw, Ingelfantis, Internet Protect Self and resource (IRC [214, 14], 14]	1.1000.01.0	One adverts that?	Name (and in star)" Window & change (and	the profestor?
Adda ( ) Politica Nazionali ( anna Azak Andreas C Antolicationi 1. Million ( ) Functionian 2. Million ( ) Functionian ( anna Millionian ( ) A	1.0400.000	SP's 4 2" and souther No ages where: Mark the cases	(E's 612" and states The space colorest Research colorest	10" x 114" work counter Marca One dawn in dawr - Ogwerhanig far fawr oddiwrau
<ul> <li>Deter studi characteris termani verse unit calan qui patra l'auti (2011) 2011 (2011)</li> <li>statis for dazzini chala v.r.a comert, / autilia characteri filondati (2011)</li> <li>Deter statis comerte reaction (2011)</li> <li>Deter statis comerte reaction (2011)</li> <li>Deter statis comerte reaction (2011)</li> </ul>	A dispersion of the	For distant too For distant Sir statement	A 12" de local sen a 127" de local d'ani a 147" de local d'ani	For Print and For Print and For J For Indian
Netherland and leader (000 (2014) (2) (2014) Sector (2014) (2) Annual Melly Pri and 2014 (2018) (2)     None is and anges on if any off of an extern experiment.     Ideal and any strong and well counter parts. Program 17 These and another     Ideal and any strong and well counter parts.     Ideal and any strong and well counter parts.	A Provinsion	- Initiant action off-adjacet case. Account of actioning Technological case from	<ul> <li>Salet, and leads to lead advances much - Nalet, and charaf and advances - Tube, and classes with user. Then</li> </ul>	<ul> <li>Note, out cash to have oil, need - Toble, and provid with exactly - Toble, and marked all same free</li> </ul>
<ul> <li>Kitar at animi tak alagain wataan sina taka alahi nag tam taf</li> <li>Kitar at at at animi taka an animi taka animi taka ani</li> </ul>	A Wellinger	tara f if with	100417-08	Sala 214 wile
<ul> <li>Mutting Research (solar score second UK 1201041.)</li> <li>And Solar Control of Association (Solar Solar So Solar Solar S</li></ul>	A COMPANY STATE	49	16.01	81.0
Total deadd on in Instant or count of grifting     Securit on a safety coloned or count of grifting	R lateries	1	1.9	Name its change, association for WC Automatic
<ol> <li>Binday</li> <li>Constanti volume cana un fasera dessa conflictiona, effecto activato telegal</li> <li>France inclusione constanti constanti functional dana consta (data constanti data)</li> <li>France inclusione constanti constanti partenti bati</li> <li>Statuto constanti data</li> </ol>	6. Killin (1991	Tand vanit omer 10. d'and het (sold taon), 200 d' 2007 vanit oper 200 d' Table vanit oper 201 d'	Table root in the Eli, of soil (sole room), (2017) There root areas, 2017 Table root areas, 2117	Tradition and Etc. of well inclusion month. UNLIF Origination and a 2018 Table month proc. 45 (2)
<ul> <li>Notifical date of seal for gain correctly last</li> </ul>	Sector 1 - Name			0
<ol> <li>Even Particle</li> <li>Address Tambér MacDarg sum with Space aspecters regions closer</li> <li>Statistican real</li> </ol>	Sectored.			
<ul> <li>Kapper/2001 (and Nor even AVE 100-331.8)</li> <li>Second and Ave Ave Ave Ave Ave Ave Ave Ave Ave Ave</li></ul>	Indiana - Automatic			
A SPECIAL METERS AND A CARL AND A CARL AND A CARL		promption and the fact that the	d introduction on appendi	and all of the second party.
and the 1 strate the all has				

### 8.2.8 Selecting the Optimal Universal Care Unit Treatment Room

An untight-provident/orthogen to Margan (1997	Mainter	del, anne hin, itolating In Brag Hogelst, ha inden Tagen, des tite	1.1	Disentance Exclusionario score Eccloseration			
Names ( - Andreward	BORDER - Joseful						
The CHIL Transmitta Transmittane Transmittane (Children) of the CHIL Transmittane Children of the CHIL Trans		E Tuesday		A Day			
Terren (same file)	1.111100000	HET D. HART F.C. & check pres F.C. & having some F.C. & having some	THE REPORT OF	F-12" & debad gen F-12" & debad gen F-12" & family som F-12" # family som	HIT & man		
Devendreiten Nerd wert sind (2011) (2012) (2012) Well maar leit bestelen Well maar ist bestelen Well maar ist semplem nachter bei skanling Darsse diegenal, gibten diegenaat	A constant	BER Strik, ginnen, mette trezentarion at from of paramet Emerting of local of paramet	2019 Sire, gitnes an feit of partiers, Water exceptions, Charring an anis of patters	1919 Sett, given, charling, werts compared on the data of all all function of camers	17.95 Grin, glassel at Burt of patient Baster exception, Char Bug atte-Opatione		
Relian ) - Project Rational Carlett Bala	6. hatky	Solar division and and a	March Cod works	Residence assume	Altoute strikk reaution		
Instruction security advect has (1) of the instrument)     Advectory provide the system of the	•	Han of activity handler 3 Marca Rad and Karr and 3 Marca garbay fails and 3 Marca garbay fails 4 Survey are head an apply to	. Anarani tanaki maan	Base of advant is a value 1 block had to a floor wat 2 block gamery take start 2 have a start to had 2 have been block at wagte to	Instantia sectore i anche Entres de la contracta del Estata genera del contracta Estata genera del contracta e disartere contracta contracta e disartere contracta contracta		
<ol> <li>Antonic focular</li> <li>Antonic focular in a construction of a construction of a construction of the constru</li></ol>	1.000000	Rependinge fol sprinter Parentially bank to keek	Parallel to carriere Parallel 14 sections	Parales to contraine Presentaria lande la back	Parallel Incorrence Protection Systems In Address		
Configuration for international during for other     Key Section 1	A. Marriel Addre	Technologies (CL of well) 14110	Tax not are St. of early (1) (P	Stanton and Standard (State	Total contracts (Contracts) (AA.19		
Concrete Impacts the end of the product of several several several several several several several distances and several	a second second	Georgemanie 1279	Over netty proc. 122 IF	Oversom and CRUP	Garrent and 1079		
- In the second se	Restort - Present Successed						
		10					
Nallan 9 - Pala e Malafinai							
Section of repeat I/CO Tradework Room design at monoportate Trade plane.							

# 8.2.9 Temecula Valley Hospital Integration

Service 1 - Budgetand	Sector - Balance			
Tension table inspirat (Mellin sovers), only construction with a sampletion Annual ARSA. Mandang on (API reprints provides) and provides construction for the balls, and an include for the SBM without segment and with a spirat particular structures. For including sources are: 1. Support of segments with source including sources are: 1. Support of segments with source including sources are: 1. Support of segments with source including sources are: 1. Manual for a support registry with source includings: 1. Manual for an experiment of the sources and the source are spirate sources for sources to be balling bullets 1. Support of sources to experiment ABM 1. Support of sources to experiment ABM 1. Subject of the sources of sources are of the sources and the sources and the sources of the sources are and the sources of the sources are an experiment of the sources are and the sources of the sources are an experiment of the sources are an experiment of the sources are an experiment. 1. Subject of the sources of the sources of the sources are associated and t	Torkes Inclusi Anna Jan Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite Anite	BOLDETION OF INVALUANCE House Flat have been provide for information in Access being reasons when any second provide second to an any second provide second to an any second second second pro- mension in the advancement of the mension in the advancement of the partners of contract second pro- parameters of the second second pro- parameters of the second second pro- parameters of the second second second the second second second second second the second second second second second the second second second second second second the second second second second second second second second the second s	RE Indust Carro Indo and contraction and the site, and including that improve the membrahant and of another membrahant and of another	STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS STATISTICS
Inter 7 - Balles Balancella on Inn	out the provide the	and the line	-	And in case of
Henrich Talling Berghalt I. we staff prefer instruction with a completancies of 2000. "No conserved? Songle for this preparit is RECONSERVED." This conserved head more all following on the conserved for the conserved of the con	And State	Alternative inspect times in order with and particle times. Alters in here survive staff conservations of an and time defense of ApP productions	Adapt Schlicher In Indeed with State (Self-schlicher)	DUR
	Anna Part	attential regime the train of reliated with Addition to a setting of attention to a setting attention to a setting	Aetart bestieten in estatet aut tres Sulf seletation	Majar 
<ul> <li>Not Water Sprint</li> <li>Not Place Solid has not Capacity the agreent follower (historating)</li> </ul>	our beginning the			
	Marthala	Internet Nater Schladure Internet Nater Schladure Backing Nater Market Bergersenete Internet Back Billeren gind arlandel und Blanc Gangethesis Contents agenticities Gangethesis Contents of Unit Schlad A Mark Touris Internet Internet Backing Internet Internet Internet Backing Internet Internet Internet Internet Backing Internet Internet Internet Internet Backing Internet Internet Internet Internet Internet Internet Backing Internet Intern	4-30 second in Asian Artification Artification Artification and Asian Artifications in Asian Artifications in Asian (KAR) constant Animates 21 of Ministry Contentions 21 of Ministry Contentions 21 of Animates 21 of Ministry	NUMBER of the set of t
		Hart Rostoff in Yop (Ukong) Too Internet Internet Specific House Respect New Internet Specific House Respect New Internet House Specific House Respect Restoff House Specific House Respect Restoff House Specific House Restoff House Specific House Restoff House Specific House Restoff House Specific House Restoff House Specific House Restoff House Specific House Restoff House	print the high science, high an angle science, the science of print and the science of print of the longest of print of the longest of print of the longest of the science of the science, the science of the science of the science, the science of the science of	estilieitet Gegenet Kong ensi att Geruh In Pariet 10, teo St Scheining

# 8.3 TVH Lessons Learned Spreadsheet

	Lessons Learned					
	Lessons Learned				-	
	Inner	Description	Design	Contract	Field	п
ire / 1.3	e / Safety					
	Fire Alams wiring	Fire alarm wiring does not need to be in conduit. Fire wiring in corridor does not need to be in plenum mied only fire rated.	x			
MEP						
	Underground Conduit Coordination	Coordination of the underground conduits may be valuable for helping out schedule in the field		0	x	
	Hargers	Check hangers with laser to ensure accuracy			X	
	Trimble	Ensure that dimensions are shown on trimble layout drawings to double check in field			X	
	Seismic	Make sure seismic attachment points are located within 55° to center of thate			X	
	Underground Conduit	Slab on Grade - Slurry on top of electrical in some areas prior to rock to prevent movement			x	
	Trimble	Set tolurance of trimble to 1/8" typical			X	
	Control Points	Control points need to be established and coordinated on every floor prior to generation of winkle drawings			x	
	Trimble	No trimble for underground layout (plambing)			XX	
	Seismic	Signmic pre-install monting with IOICs. Seismic drawings are difficult to follow so the scismic engineer helps decipher prior to install			x	
	Underground - MEP	Provide greater installation areas for individual trades		12 C	X	
	Underground Electrical	Address electrical heat generation concerns with IOR seam prior to installation		1	X.	
	Underground Electrical	Electrical conduits should be installed first, prior in grade beams and plumbing			X	
	Underground Plumbing	Plunibing waste piping should be scheduled after grade beams are complete			X	
	Underground Electrical	Bundle more individual branch conduits together to lower risk of damage & to provide more open and for movement of rock				
	Grade Elevation	Check final grade elevation with survey after grade beams are complete and prior to electrical installation			x	
	Depression Layout	Layout all depressions prior to installation of electrical			X	
	Underground Design	Finalize design, OSHPD related charges, and documentation prior to start of work.		12		
	IT/IS	IT / IS can be taken for granted make sure mough collaboration and time is dedicated to it.	x		x	

120000	ula Valley Hospital	WINS ARTHER HMC Architects bBergelectric	Wall Work	W. LILLING	store Bailt	and the second second
	Lessons Learned					
	Innue	Description	Design	Contract	Field	ID
	Cross Discipline Review	Look at details in drawings (cross discipline review)	х	an four first dependences		
	Local Ordinances	Need to check all local ordinances that may govern. Don't just assume OSHPD takes percedence. Local may be more stringent	x			
	Deferred Approvala	Because we submitted line 8 before line 1 USAT has had to recoordinate seismic twice. Differred approval may have been the way to go, when they are advantageous	x			
	Document Control	Document Control process needs to be put together early and captured in Div 1 specs	x		x	
	Dimension References	Architectural dimensions to walls need to be accurate and consistent, measuring to face of stud, typical	x			
	Waterproofing at prefid- abowers	Eliminate waterproofing behind preflab showers	x		x	
	Truss Drawings	When doing truss drawings have gauge identified. Typically shop drawings do not incorporate ansates. Future Projects to look at assures.	x			
	Functional Space Program	Need to find a functional space program and make sure our design supports it	X			
	Endoscopy Room	Make sure Endoscopy room codes and design are reviewed thoroughly	x			
dock-Up						
	Mock-up Schedule	Finished mock-up should be completed prior to construction. Timing of construction should be further discussed			x	
rocesse	- Project Management					
	Field Coordination	Adding select few of the foreman to the pull plan early for key trades will help with epordination			x	
	DCR's Tracking	Use Notevault at onset of job for streamlining of DCR's.			X	
	Exterior Wall Track	Due to heating and clisching the steel during creation to get steel straight and plumb, attaching slide clips and or slide track to steel pour stops heftere creation does not work				
_	Lesson Learned Tracking	Put inplace a system to start tracking lessons learned at beginning of job			x	

Lessons Learned				-	
Issue	Description	Design	Contract	Field	ID
Deck Layinit	Composite layout firr all trades on dock imarts - this is working well			X	
JOR	Bring IORs onboard to look at drawings early				
Slurry Buckfill	Slumy helped with projects overall schedule in lies of using native for backfill. The savings to the schedule outweighed the cost of the slurry around the slab on grade.			x	
Pull Plan Turnover	Need to understand what each expectation is on pull plan turnovers. Need to communicate when something is done it is mally done	x	x	x	
Pull Plan Semiona	Small batch pull plan sessions works better (2 - 2hr meetings a week vs 1 mtg)	-		X	
Staff Meetings	Small batch staff meetings 15 minutes a day in lieu one large staff meeting			X	
Onboarding Vendors	It is important to onboard the owner's vendors early and get them involved in the process		x	x	
Go and See Trip	The Wellington Project being orgoing allows for excellent learning opportunities and leasons learned that can be incorporated into this project. So and see their project with the last glanners as their respective work begins at Wellington.	í.		x	
Field Communication	Use maniff and foreman trailer to better communicate with craft by posting boards that allow everyone to present suggestions			х	1
Firsproofing out of supsence	Fireproofing exterior beam out of normal sequence allowed the enterior wall to go on ahead of schedule.			x	
Bigroom Technology	Using Apple TV and television screen is more cost effective than a smart board and allows for a more collaborative covironment.			x	
Electronic Pull Plan	Having an electronic pull plan allows for the participants to enter their tags ahend of time and then the team reviews them at the pull-planning session. This also eliminates one person frank having to data entry everyonic's taga.	x	x	x	X
Shared Layout	All partners should use same control points to ensure consistency and avoid small discrepancies. Potentially on next project one computer perform all layout			x	
Specialized Vaccum	Use specialized vacuum in lieu of sweeping			X	
Daily work plan	Utilizing daily work plan sheets to connect field and office better			X	
Internal Productivity Tracking	Sharing internal productivity methods within group for higher level of understanding			X	1
Shared Loading Areas	Installed leading areas with a shared ye-ye fall protection system at every floor to make unloading efficient			х	
Visitors	Make sure that all visitors to the Big Room are introduced			X	
Deliveries	Coordinate heavy equipment deliveries with interior framing installation			X	-
Field Lanches	Field lunches with tradesman add value and provide a lot of ideas			X	

Lessons Learned					
Issue	Description	Design	Contract	Field	ID
BIM Modeling	In HIM model incorporate roof actual section (insulation)			X	_
Embeds	Use anchor bohn for HVAC units in lieus of embeds		-	X	_
Pull-Planning	Do not underestimate the shoulder to shoulder and micro pull plans. Shoulder to shoulder should accompany OutPlan.			x	
Permanent Control Points	Set permanent external control points (possibly set in concrete)			X	
BIM	Use common room/collaborative space for entire BIM coordination process including detailing	x			
Survey Points / Control	Overlay servey points with building control points prior to layout		-	X	
Bench	Always bench in with 3 points	_		X	
Grade - Beams	Lower grade beams where possible (possibly leave out top portion of grade beams and fill during SOG pour)			x	
Grade - Beams	Have the ability to sloeve top 1/3 of grade bours			X	_
Rock backfill	Utilize smaller tracks for leading rock into the building to prevent and damage to work in place (i.e. plumbing & electrical)			x	
Backfill under building	Look into using sand in lieu of rock for fill prior to vapor barrier			X	
Jobsite Office	Removed portions of wall by plan table to open up office area. This helped tie the office toacther more		1	x	
Jobeite Office	Added an intermediate size conference room. We had the big room and small http:// out.tooms.hut.nothing in hetween			X	
Pull Planning	We have found that by having the partner that is currently driving the scoperischedule leading the pull plan session emerates more discussion			x	
Schodule	Label areas in schedule to match areas on the plans to avoid confusion or make somenclature completely unique			x	
Best Plate Tolerance	Install a larger C-Channel			X	-
Bent Plate Tolerance	1° overhang on top and bottom track			X	
Bent Plate Tolerance	Field wold the bont plate			X	
Metrics	Utilize better metrics related to PPC. We are using PPC vs. completion date. Tasks Anticipated (TA) and Tasks Mode Randy (TMR).			x	
First Ruts Study	When performing 1st run studies it is better to record a cycle rather than a 10 minute again			х	
Hardware schedule	Revit hardware schedule should be cross checked with the actual door and hardware schedule			X	

Contraction and the second se second second sec					
Lessons Learned					
Tesue	Description	Design	Centract	Field	ID
BIM Modeling	Make sure that monokote, ductwork flanges, and ductwork insulation is taken into account in BIM model			x	
Communication	Improve communication and make sure what is said is what is understood	X	X	X	
ACO	Don't have ACO onsite on the day it rains (Densglass)			X	
Pull Plenning	Continue to instill importance of bringing up issues on daily check-ins. Don't become complacent	x	x	x	
Operations Issue Log	Generate an operations issues log for owner items/changes and direction to proceed from UHS to GC PM to the Team			x	
5 Why's	Perform 5 Why's sooner so that the changes can be implemented immediately	X	X	X	
Design/Construction Pull Plan	Breakdown the gap between design and construction on check-in / pull plan	<u>x</u>	1.1.1.1	X	1
Chasters	Maintain continuity in clusters from design through construction. Have a handoff as people change during the project.	x	x	x	
Safety Tracking	Track Safety like production to make it more visible			X	-
Fireproafing	FP was sprayed too thick in some places coupled with some construction tolerances created perceived elevation bast			x	
Fireproofing	Issue and explain FP shop drawings to all effected trades. FP could have been scraped in lies of re-piping			x	
Schedule	As a reminder schedule and sequence should continue to be challenged and discussed throughout course of he project.			x	
Schedule	If a mock-up is not foasible look closely at renderings and elevations as a group to reach conserous			x	
Modical gas fittings	Medical gas drop fittings can be reduced by rising vertically or no more than a 45 degree angle			x	
Floor Mounted Sinks	At floor mounted sinks install 1* rock and then 1* concrete for blockouts so that area is safe and sink is protected until needed			x	
Tools	Give workers ownership of tools by putting them in charge of their own and giving them their own sitemage carts			x	

8.4 TVH Implemented Innovations Spreadsheet
---------------------------------------------

	cula Valley Hospital	DPR Terner HMC Authorsts Bergelectric Education DPR				
Implemented Innovations						
	Innovation	Description				
1	Application for I Pad for req	uesting equipment				
2	Sissor lift plan table / board					
1	Kiosk's					
4	I pads for foremen					
5	Use of cordless tools more it	ian any other job				
6	OR code program					
7		hen knocking out floor cans to reduce mens below				
8	Vacuuma vs. brooms and clean vevep					
9	Modify existing tools to make more efficent ( plumbers grinding down matdriver to make tightening of bands easier)					
10	Use of Notevault to combine DCR's from both trade partners and some commoditity contractors					
11	Use of backing tool to reduce the time of laying out wall backing					
12	Plauma cutter vs. 4" grinder for cutting holes in bottom track					
13	portable chop saw tables					
-14	hey-out table for stud layout on bottom track prior to laying on the floor					
15	Visuals for backing locations to ensure correct locations					
16	Project Inertia highlighting inspection area electronically					
37	Framing mock-up of all connections to aid inspections					
18	Utilizing a 3-segged ladder to allow for access to corners and through framing					
19		Ground, Neutral, and hot wires are being combined by manufacturar in barrel in lieu of performing in field on separate speels				
20	Box layout with story pole					
21		ofing is wet so thi it does not need to be semped later				
22		as drills in lieu of straight drills so that exterior studs can be screwed next to I-Beams				
23		Sectioning hanger batches by area and not be system and area				
24		Utilize onsite med gas pre-fab tradler in lieu of shop fab to lower inspection costs				
25		r the scissor lifts to hold tools and materials				
26	Electrical Prefab carts					
27	Purchased condless drywall s	unw gans based on worker feedback				
28	Added spool sheets to kiosko	and allow worker access at home				
29	Pre-program CAV controller	s with battery and inverter in lieu of requiring permanent power				

	Implemented Innovation	2005					
	Innovation	Description					
30	Utilize Tite-end true torque t	nut in lieu of standard anchor bolt. Bolt snaps off at required turque and torque test not required					
31	Plug tail device in lieu of sta	ndard plugs. Plugs only have to be connected on the backside reducing labor and troubleshooting					
32	To protect prefab showers a sprayed on lates is going to be utilized.						
33	Have lunch with workers to increase transperancy with workers and spur incremental inovation						
34	Plangrid - Utilizing plangrid program to track rework and potentially use for punchlist / signoffs						
35	Continuous Baznoka for tapping operations.						
36	Utilizing quartely field surveys to help improve communication and extract ideas						
37	Lead man coordination meetings in lieu of just GPs to improve communication						
38	Utilizing Apple Facetime to	quickly communicate a visual to engineers					
39	"Carnie Hooks" are being utilized for cord management. Inexpensive option can be handed out to workers. \$3.00/ea.						
40	Utilize low torque screw guns for backing due to heavy gauges.						
41	Sheet metal made a shroud for the chop saws in lieu of the dens board to catch sparks/debris.						
42	Extension for roto hammer/torque wrench to install soffit top track anchor bolts. Made in the field by JM.						
43	Taking gictures with notes in them so that when the picture is issued to the field it is known what needs to be done.						
44	Utilize inverter to test CSFD's with field staff and IOR's prior to permanent power.						
45	Utilize countdown clocks for different milestones throughout the building.						
46	Utilize 26 ga, sheet metal in	big room so that items can be magnetized to the wall.					
47	Use Sprayer for final pass or	a Level 4 Finish will improve productivity.					
48	Use a group washout for taping operations						
49	Utilize a dashboard to reach information on the project more efficiently						
50	Utilize 360 interactive project	ct tour linked to floorplans					
51	Utilized dust muzzle bought	from local store to mitigate dust from concrete cutting. This item costs approximately \$60.00. Similar products sold by Hilti are					
52	Ultra Ever Dry Special conti	ng so that liquids and other materials do not stick to desired surface.					

# 8.5 TVH Ah Ha Moments Spreadsheet

Temecula Valley Ah Ha Moments Directory					
Title					
Architect					
Mechanical Trade Partner					

Kristen Hill	Lean Coach
Bob Kenz	Fire Protection Trade Partner
Margie De Laurell	Engineer
Marius Nimitz	Architect
Ken Lindsey	Mechanical Trade Partner
Dave Seastrom	General Contractor
Nancy Squartino	Owner
Ward Thompson	Architect
Lee Tsangos	General Contractor
Steve Wilson	Architect
Steve Yots	Mechanical Trade Partner
George Zettle	General Contractor

Ah Ha Moments				
Date	Who	Moment		
12/7/2010	Seena Hassouna	The use of A3's. The team was working on the ICU redesign issue. He'd been asked to type up a summary of a phone meeting the team had with OSHPD and discussed it on the core team call. As he begun the summary he realized that the A3 was a tool he could use to present the summary but also begin tracking some solutions he was working with. He copied and pasted his summary into an A3 template Jessica H. sent him and then he added some graphics that he was working on as well. The A3 was well received and it really helped everyone to get an understanding of the issues the team was having.		
12/15/2010	Steven Wilson	Was pleased to know that the process of breaking the submittals down into increments and submitting them would help with the speed of OSHPD's review. OSHPD's review comments on the construction documents helped with flagging issues that would perhaps occur with later design.		
12/15/2010	George Zettle	Was touched by the threadig of emails showing compassion and concern about our team members (Tom M.)		
12/15/2010	Rebecca Hathatway	Wasn't to clear about the design sets by just looking at them, but after talking and listening to the team communicate she then understood. By understanding what was going on she then was able to address the A3. She also learned that no matter what OSHPD threw at us, we were able to fix it.		
12/15/2010	Steve Yots	Shared with us a comment that OSHPD said "This was the best project in years".		
12/15/2010	Kristen Hill	Pointed out an ah ha moment the Site Planning Team had. It was a lesson learned on how to communicate with one another. Basically the requests (post-its) needed to be straight to the point and discussed. This way it could be a shared decision on whether that request is really needed.		
1/5/2011	Dave Seastrom	Review of the owners manual that Jessica and Rebecca are working on, gave him a better understanding as to why our team is creating one.		
1/5/2011	Ward Thompson	While reflecting on this project during his holiday break, he realized that he is really having a good time working with everyone. He feels that people in the "Big Room" are friends.		
1/5/2011	Kristen Hill	Wanted to "Pause and Reflect" on Ward's Ah-Ha moment. She says it goes back to the PDCP (plan, do, check, principals). This increases the trust within our group. She suggests that we adjust to make PDCA a part of the process in the "Big Room".		

1/5/2011	Seena Hassouna	Reflected on the project during his holiday break and felt that it hadn't consumed him as with other projects did in the past. There were no worries.
1/5/2011	Ken Lindsey	Shared his appreciation of Lee, Tom M., and Doug work during our holiday break.
1/5/2011	George Zettle	The Budget Cluster meeting had very good communication with the progress of all of collaboration of good work ethics.
1/12/2011	Nancy Squartino	Currently working on another project that is not using Lean Principals. During a discussion she found that it was hard to communicate solutions to problems without an A3. She admits that once you are exposed to Lean Principals you wish all of your projects works that way.
1/12/2011	Rebecca Hathatway	Last Friday, the A3 Funding team was working on completion. During this process everyone focused on making it a piece of art and as the tool it really is. They needed to re-create the A3 in order to tell its true story.
1/19/2011	Margie De Laurell	There were environmental occurences that could set back the schedule. She talked it over with Steve W. and asked for his help with some tracking. She then realized that she could of taken the initiative and done it herself.
1/19/2011	Steve Wilson	During the KoP presentation he was impressed with how Rebecca, George V., and Jessica understood their clients needs. They addressed issues that were sensitive to this project in a way that made the client realize (1) it was there, (2) there is a solution, (3) we will work on it together.
1/19/2011	Kristen Hill	Reliable Promise! (1) Component to perform a task (is there enough time on the calendar) (2) Usually is done out of sincereity, with in mind I'll do it on the contrary (I'll do it when I know I really can't) (3) If I can't keep the promise, must go back to the team and re-evaluate it
1/26/2011	George Zettle/ Kristen Hill	While working on the 'A3 Advance with Lean Skills' George discovered that no matter how you start an A3 your thought outcome doesn't happen. The solution that comes from an A3 is unforeseen and is the reason why A3's are so successful.
1/26/2011	Steve Yots	At his home office, his colleages tell him that he's changed. His thought process and procedures truly reflect the Big Room culture.

2/1/2011	Lee Tsangos	He thought agendas and pull planning could be done more efficiently be a few people. Then he realized that it takes the whole team to participate in order for all to be satisfied with the outcome. It's really hard to try and plan for everyone else if they do not participate. It takes the team to have a successful Pull Plan session as well as a successful agenda.
2/1/2011	Bob Kenz	He was able to create a Pull Plan for a dinner he planned with his wife. Their dinner was a success and very organized.
2/8/2011	Seena Hassouna	With a deadline approaching the idea of experimenting a new process to reach a goal is definitely a Lean process. The traditional way would be to reach that same goal as we would normally do it. It's all about taking on new ways as a team to reach the team's goals.
2/8/2011	Kristen Hill	Within breakdowns like a OSHPD Increment Submittal, there was discussion about whether to try something new or stick with the traditional way. The traditional way is the "know what to do" based on individuals experienceswhere the Lean process is the "experimenal/learned on the fly" which is more of a team effort. Discovering new ways and exploring them as a team is the Lean way.
2/8/2011	Marius Nimitz	Cllient supports experimentation with work process.
2/8/2011	George Zettie	Even though it is hard to redesign how we do our work, it is a must to achieve the overall success.

### 8.6 Sutter's 5 Big Ideas Survey

# **Temecula Valley - Cultural Outcomes Survey**

The goal of this survey is collect information about the "softer" cultural outcomes from Temecula Valley which cannot be fully captured in the project's financial outcomes and KPIs. For each of the 5 questions, state the degree to which you agree or disagree with the following statement.

#### The team collaborated, "really" collaborate

- 1. Strongly disagree
- 2. Disagree
- 3. Neither agree nor disagree
- 4. Agree
- 5. Strongly agree

#### The project was optimized for the whole rather than optimized for local maximas.

- 1. Strongly disagree
- 2. Disagree
- ③ 3. Neither agree or disagree
- 4. Agree
- 5. Strongly agree

#### The team tightly coupled learning with action

- 1. Strongly disagree
- 2. Disagree
- 3. Neither disagree or agree