



Asset Utilization

November 2002



Asset Utilization



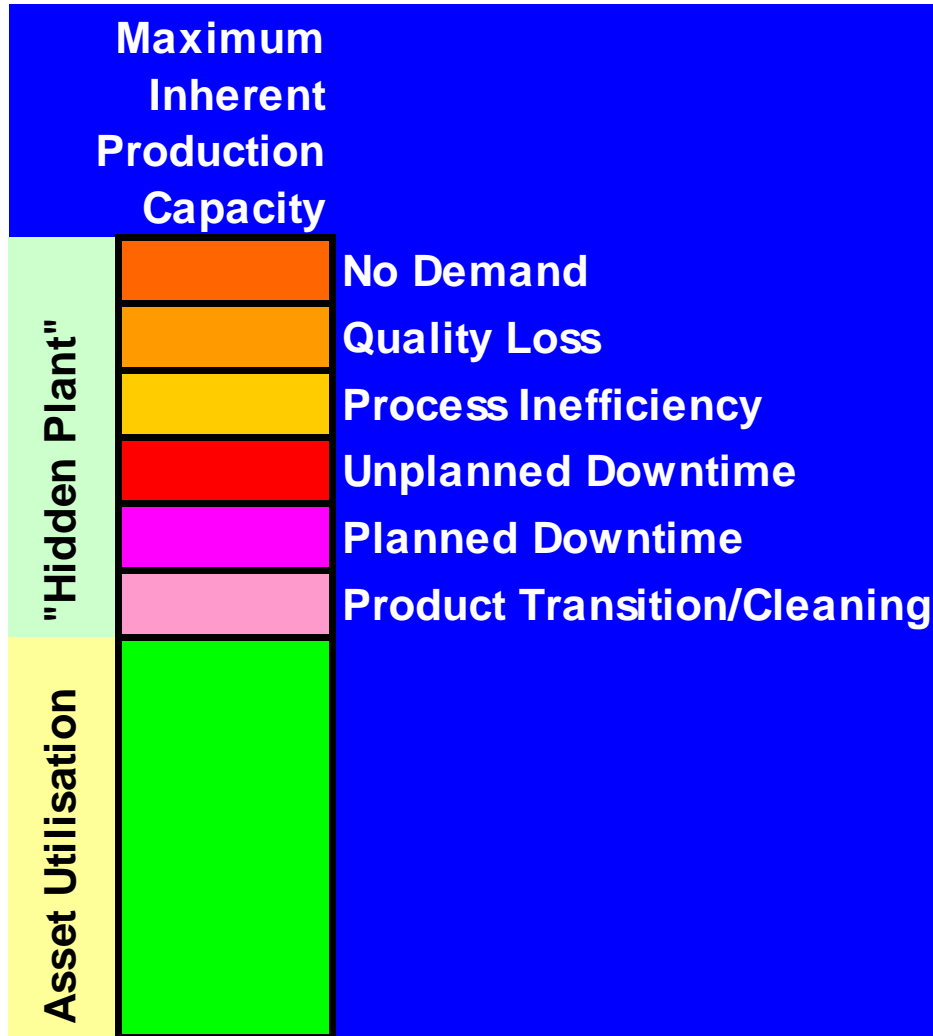
What Is Asset Utilization Project? (AUP)

- AUP is a comprehensive system developed by Rio Tinto to improve maintenance practices through **Maintenance Practice Assessment, Benchmarking and Improvement Initiatives.**
- AUP employs a **cross sectional team** comprised of both salaried and hourly employees tasked to seek opportunities for process improvement (value).
- AUP seeks to develop and apply **“BEST PRACTICES”** among Rio Tinto operations.





The Theory



- Asset utilization is a function of:
 - Reliability
 - Throughput
 - Quality
 - Demand
- The objective is increasing the Return on Assets Employed by minimising the “hidden plant”



Asset utilization Improvement Process



Stage 1

Data Collection and Diagnosis

- **Best Practices Gap Analysis**
- **Delay/Loss Analysis**
- **“Stake in the Ground” Metrics**
- **Identify Improvement Opportunities**



Asset utilization Improvement Process



4. Work Flow		Period 1	Period 2
	Work Order Types		
4.01	Number of PM and PdM Work Orders generated	920	544
4.02	Number of PM and PdM Work Orders completed	919	492
4.03	Labour hours charged to PM and PdM W.O.s	22,901	12,296
4.04	Number of Corrective Work Orders generated	4,932	2,779
4.05	Number of Corrective Work Orders completed	4,871	2,448
4.06	Labour hours charged to Corrective W.O.s	65,179	26,902
4.07	Number of Breakdown/Emergency Work Orders generated	253	256
4.08	Number of Breakdown/Emergency Work Orders completed	251	220
4.09	Labour hours charged to Breakdown W.O.s	2,114	2,404
4.10	Labour hours charged to Standing W.O.s	18,945	9,439
4.11	Number of Standing Work Orders in use	56	59
4.12	Do you have any other Work Order types?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
4.13	Number of "Other" Work Orders completed	4825	
4.14	Labour hours charged to "Other" W.O.s		
4.15	Total Number of Work Orders generated	6,161	3,638
4.16	Total Number of Work Orders completed	6,097	3,219
4.17	Total labour hours charged to work orders	109,138	51,040
4.18	Labour Hours not charged to a Work Order		
4.19	Total Labour hours	109,138	51,040

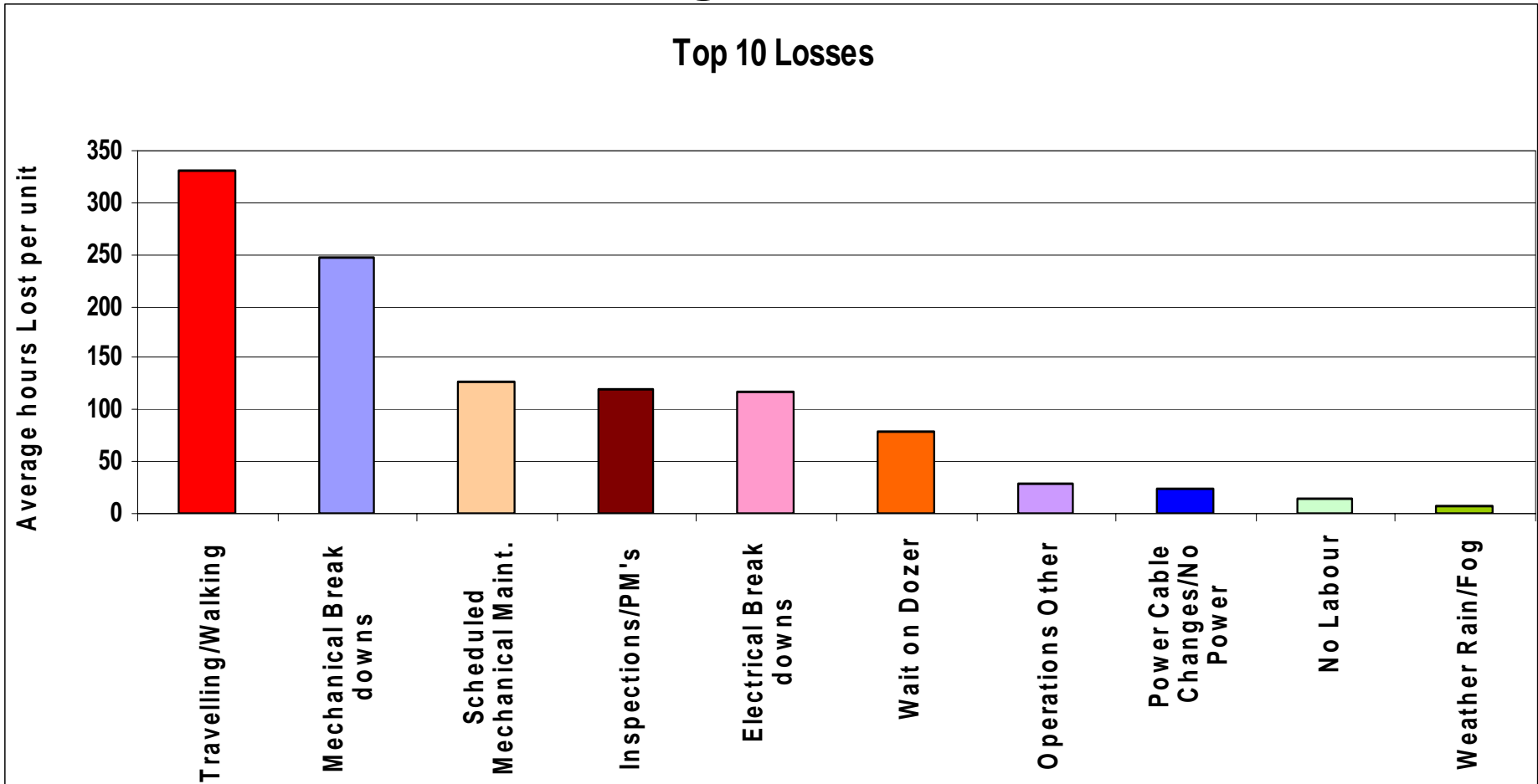


Asset utilization Improvement Process



Dragline #153

Top 10 Losses





Asset utilization Improvement Process



Stage 2

Plan Development

- **Developing a Business Case**
- **Align Ideas with Business & Prioritize**
- **Select Projects to Proceed**
- **Scope & Plan Projects**



AUP Overview



Team Involvement:

- The AUP process employs a cross section across skills and departments.
- Teams are critical in this process. The basic structure includes a core team supported by four focus teams.

Core Team	DDS Team	RS Team	Plant Team	Electrical Team
Ken Wooley	Marc Ostrem	RS Planner	Bruce A. Miller	Steve Armiger
ROS	DDS Scheduler	RS Scheduler	Leslie Thorn	Aaron Spielman
Rene Edwards	Kathy Bryan	Dave Gauntner	Jerry Hutchinson	Tom Shepherd
Bill Cromer	Steve Cowan	Pam Halbert	Plant Operator	Wade Hart
Travis Todd	Kelvin Kennedy	Dozer Operator	Plant Lead	
Lenny Altenburg	Dragline Operator	Maintenance Lead	Clint Cooper	
	Electrician	Truck Mechanic		
	DDS Mechanic	Haulage Operator		
	Maintenance Lead	Dozer Mechanic		



Asset utilization Improvement Process



Stage 3

Plan Implementation

- Site Commitment
- Funding & Resources
- Measure & Track Progress
- Sustainable Change



Asset utilization Improvement Process



Ref No	Issue / Improvement Opportunity	Aligned with Business Plan?	Risks Boundaries and Constraints	Combine with?
1	Leadership Commitment and Accountability			
9	Planning and Scheduling			
9a	<i>Truck planning and scheduling program is not being used for draglines and shovels:</i> Clearly define the work processes that are utilized for trucks and will be utilized for draglines and shovels in the execution of planned maintenance tasks. In particular,			
9b	<i>Planning and scheduling compliance is not being fed back to planning department:</i> The effectiveness of planning and scheduling processes needs to be fed back from the tradespersons to the planning and scheduling department. The feedback could be parts comp			
9c	<i>A disconnection between operations and maintenance functions appears to have developed:</i> Establish formalized weekly planning and scheduling meetings involving maintenance, production, supply and contractors. Formal meetings will include a scheduling meet			



The Prize



Return on Assets Employed

=

$$\frac{\text{Production Revenues} - \text{Production Expenses}}{\text{Net Asset Value}}$$

Outcomes through improved reliability & throughput of plant and equipment:

- **Increase/Protect operating revenues**
- **Decrease/Control operating expenses**
- **Reduce/Eliminate assets and inventories**



AUP Initiatives



- **Started July 2001**
- **Focused on three Initial projects**
 - **Maintenance Planning and Scheduling**
 - **Warehouse Stores Accuracy and Partnership**
 - **830E Hauler Planning and Scheduling**

Planning And Scheduling Problems

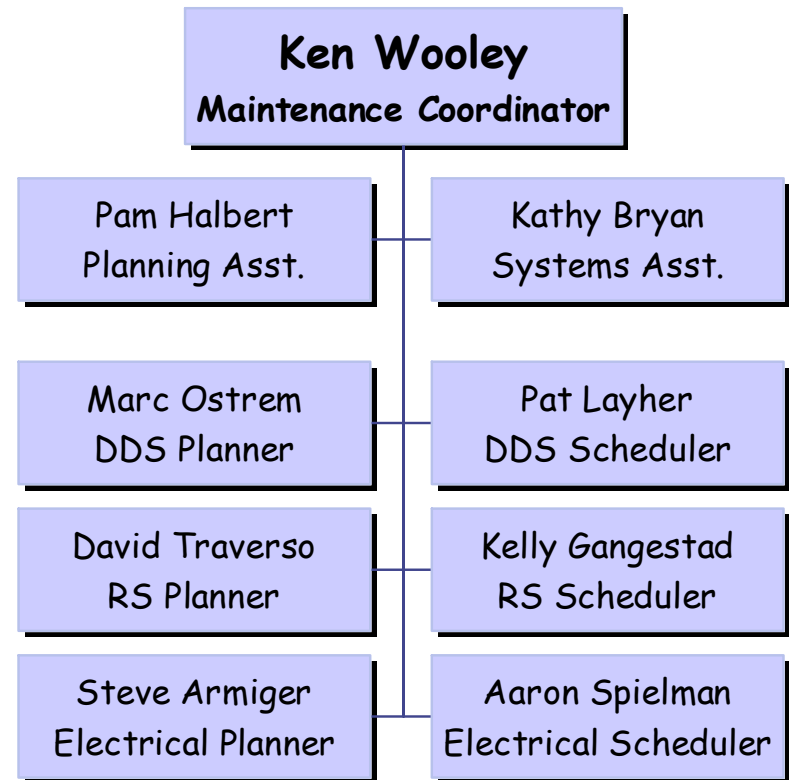
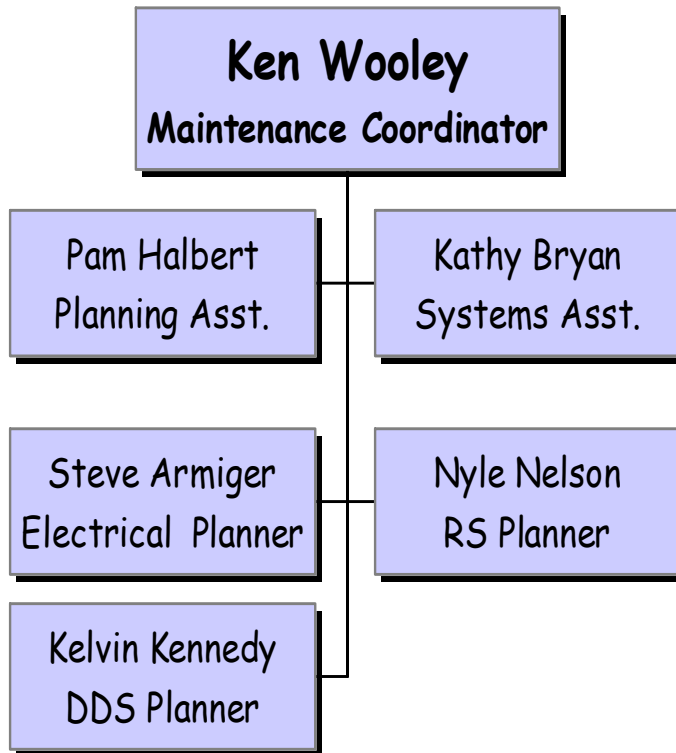


- **Planners were unable to plan due to:**
 - **Spending too much time on daily activities**
 - **Tasked with all employee management issues**
 - **Tasked with front line manager responsibilities**
 - **Maintenance practices were purely reactive**

Planning and Scheduling Solution



Review of Structure Changes





What ??



Planned Maintenance??

Buckaroos



Production Department Reaction !



Warehouse/Shop Changes



Overview:

- **Revise physical layout of parts stores. Provide areas for parts staging.**
- **Relocate 95%+ stock to South Side.**
- **Man Warehouse 6-days per week.**
- **Provide kitting for over 90% of parts used on planned jobs.**
- **Partner With Suppliers to Supply Parts for AUP Kits.**

Warehouse/Shop Changes



Positive Results:

- **Reduced Double Orders.**
- **Has ultimately lead to better communication and inventory reduction.**
- **Has provided better rebuild and warranty follow up.**



Unplanned Outage!





AUP 830E Implementation



Goals For Haul Trucks

Focused On Three Primary Improvement Areas

1. Equipment Inspections & Parts Management
2. Equipment Delivery and Scheduling Procedures
3. Manpower Management



AUP 830E's



Why It Works – The Top 10

1. **Teamwork and Support at All Levels**
2. **PM's performed on a 28-day interval instead of an hourly basis**
3. **Inspection / Audits Done 10 Days in Advance**
4. **AUP Mechanic Ensures the Scheduled Truck is Delivered**
5. **Correct Parts Delivered on Time**
6. **Adequate Manpower Assigned to Job and Kept on Job**
7. **Addition of Dedicated Truck Electrician to truck crew.**
8. **Planned Maintenance Given Priority over Breakdowns**
9. **Operators Provide Good Write-Ups & participate in 250-HR PM's**
10. **Measure and Report Project Results**



Asset Utilisation Project



Maintenance Best Practices Gap Analysis

Cordero Rojo

Period 1 & 2 Comparison



Elements of Maintenance Best Practice



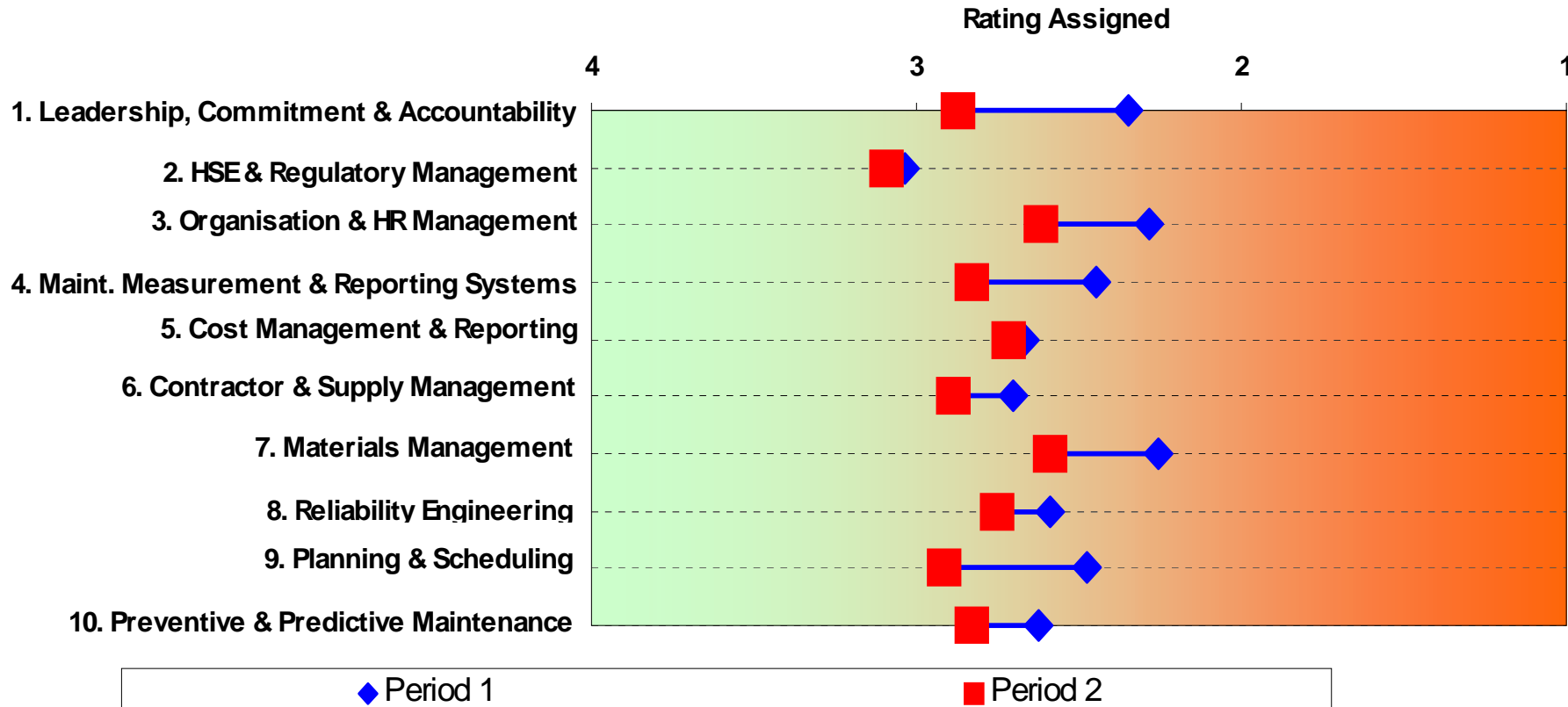
- 1 LEADERSHIP, COMMITMENT AND ACCOUNTABILITY**
- 2 SAFETY, ENVIRONMENTAL AND REGULATORY MANAGEMENT**
- 3 ORGANISATION AND HUMAN RESOURCE MANAGEMENT**
- 4 MAINTENANCE MEASUREMENT & REPORTING SYSTEMS**
- 5 COST MANAGEMENT AND REPORTING**
- 6 CONTRACTOR AND SUPPLY MANAGEMENT**
- 7 MATERIALS MANAGEMENT**
- 8 RELIABILITY ENGINEERING**
- 9 PLANNING AND SCHEDULING**
- 10 PREVENTIVE & PREDICTIVE MAINTENANCE**



Measurements



Cordero Rojo Maintenance - Best Practice Gap Analysis Period 1 vs Period 2 Compliance

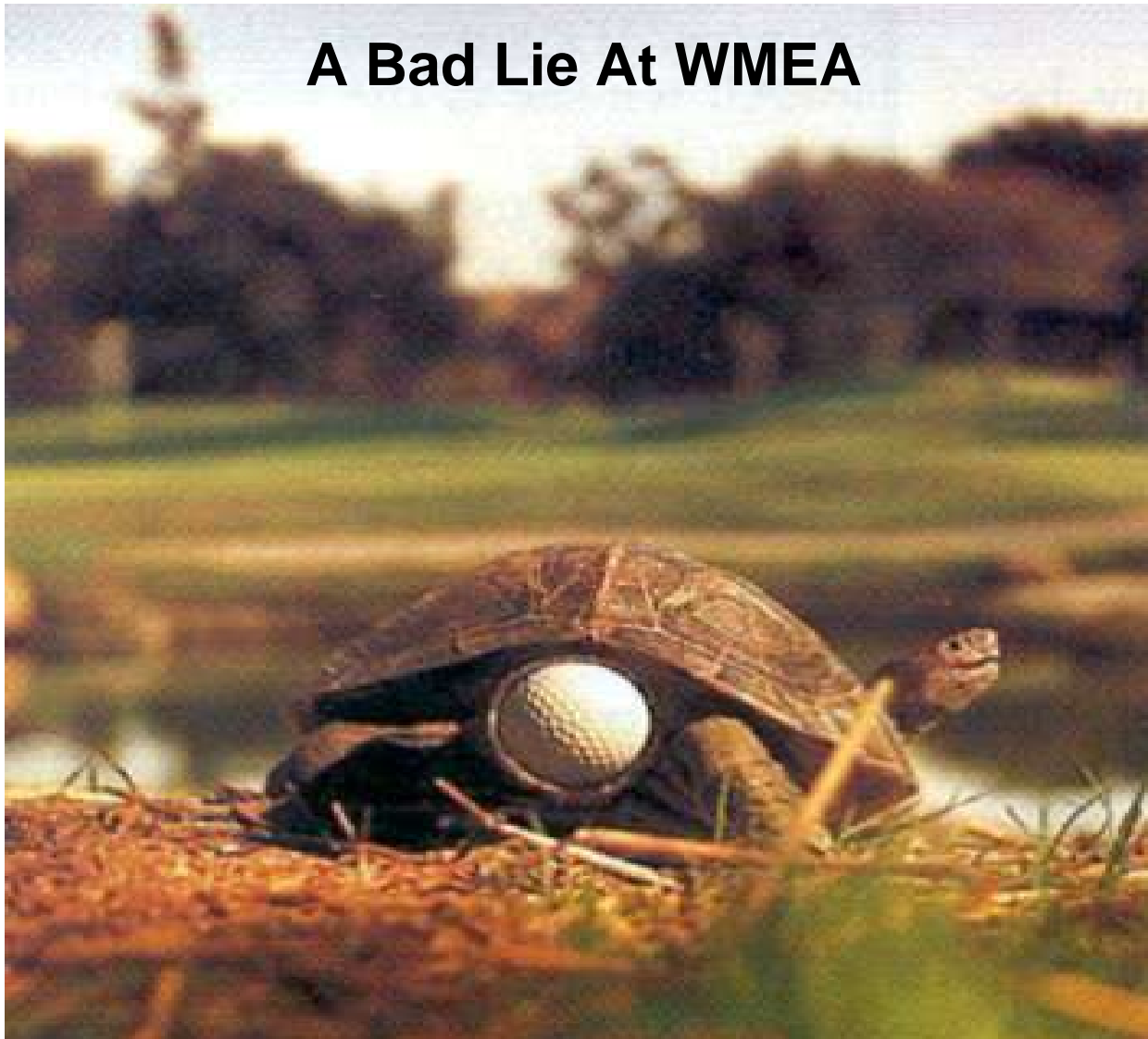




The Bottom Line



A Bad Lie At WMEA

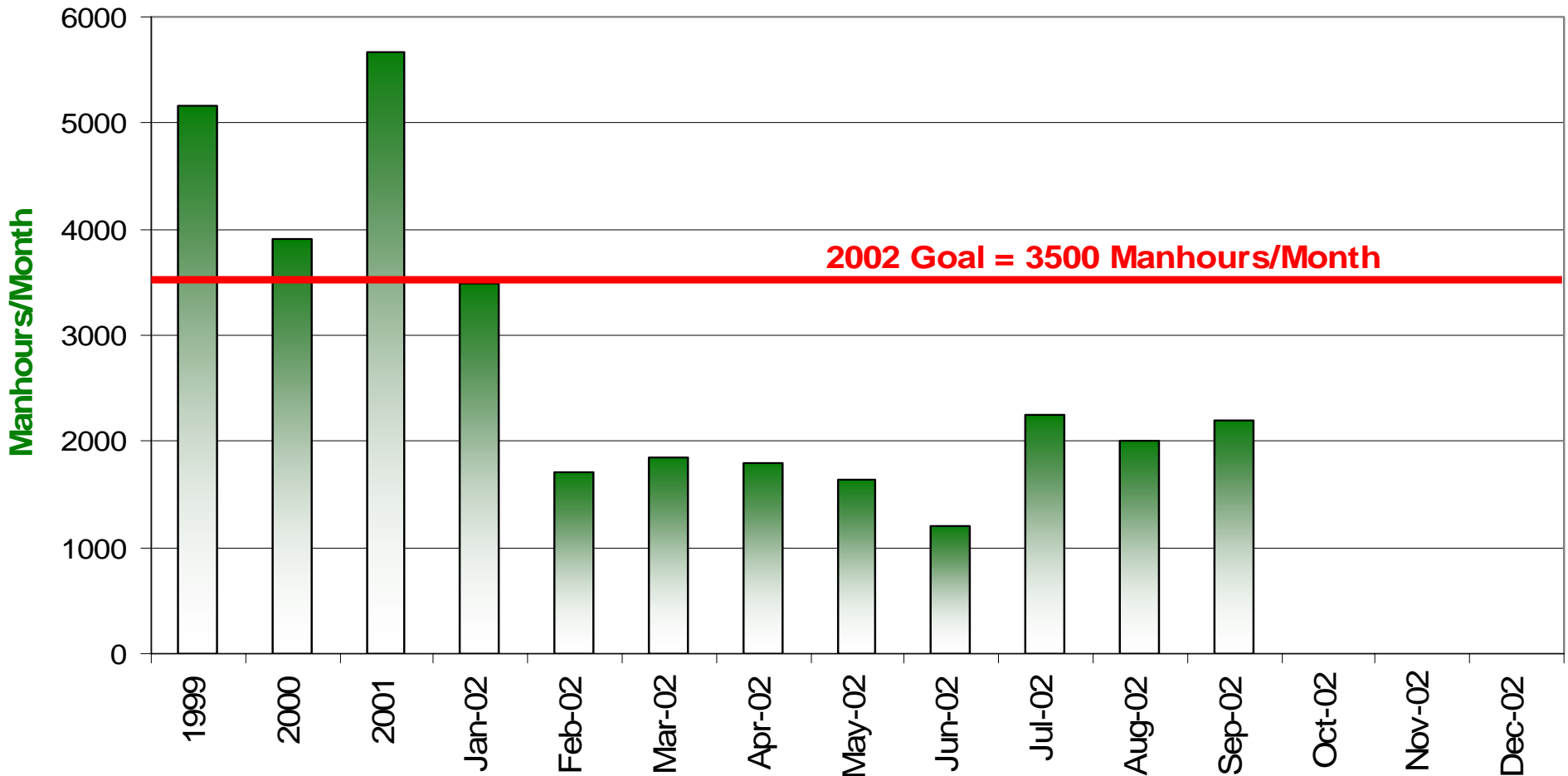




Maintenance Contractor Hours



Monthly Contractor Hours





AUP Initiatives

2002 Jan-June Average

Availability %	2000	2001	2002YTD
Draglines	84.5	85.2	91.1%
P&H Shovels	85.8	89.4	92.2%
830 Trucks	86.0	87.6	91.4%
Dozers	86.7	91.9	91.3%
Warehouse accuracy		80%	89%
Maintenance Cost Per Unit -17% reduction			
2001 actual	\$0.197		
2002 YTD	\$0.164		



830 E Gains



- **A four percent increase in available operating hours equates to:**
- **18 trucks are operated in the fleet.**
- **7000 Hour average operating time per year / per truck.**
- **7000 X 18 equals 126,000 operating hours possible.**
- **4% increase in available hours equates to 5040 hours of additional operating time.**
- **This equates to a no cost truck!**



AUP Initiatives Going Forward



- Fall Reassessment
- Electrical Project / Work Flow Study
- Production Planning Project
- Dragline Refocus
- Reliability Engineer



Shift the Focus



From the **State** of Equipment

- ***“Present levels of performance are OK. Occasional breakdown and loss of reliability cannot be prevented.”***

To the **Function** of the Equipment

- ***“It’s the responsibility of both maintenance and operation to not only determine levels of performance, but eliminate the root cause of problems. Poor reliability is a controllable problem, not a statistical fact.”***



Asleep on the job!





Me? What Presentation?





What Does Rio Tinto Bring To the Process?



- Upper management buy in for initiatives.
- Allows time for “PAUSE”, to look at the business objectively.
- Provides the manpower to dig into the numbers.
- Provides the benchmarking data used to measure progress.



Goals of the Project



- **Achieve a greater percentage of planned maintenance activities.**
- **Increase availability of equipment**
- **Maintenance cost reduction**
- **Reduce contractor hours by using in house labor**
- **Increase return on assets employed**



How Do We Get There?



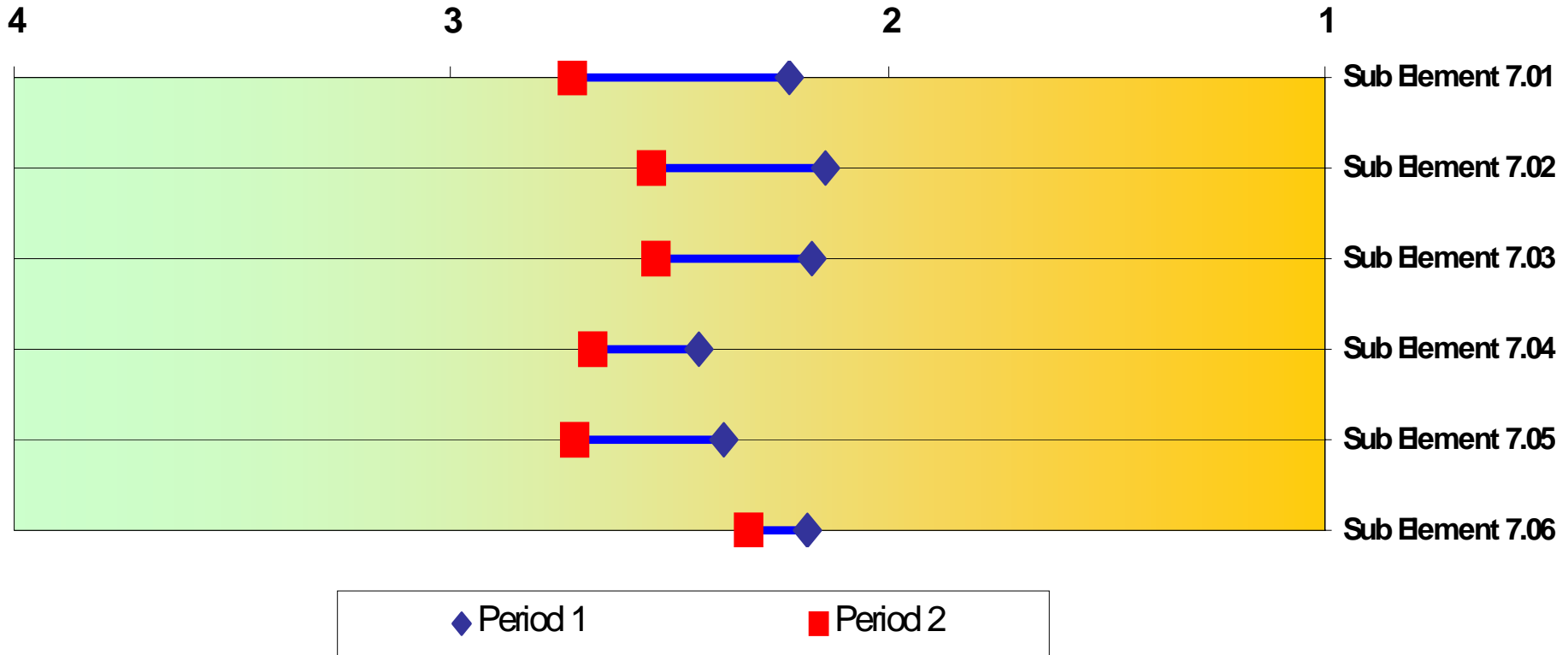
- **Identify the most significant opportunities for improvement.**
 - **In our case, we identified the need to provide reliable transportation of the coal from the dig face to the hopper as being the top priority and the key to operational success.**
- **Don't take on too many initiatives at one time, stay focused.**
- **Celebrate successes.**



Cordero Rojo Maintenance - Best Practice Gap Analysis

Element 7 - Materials Management

Rating Assigned



Best Practice Sub-Element Number

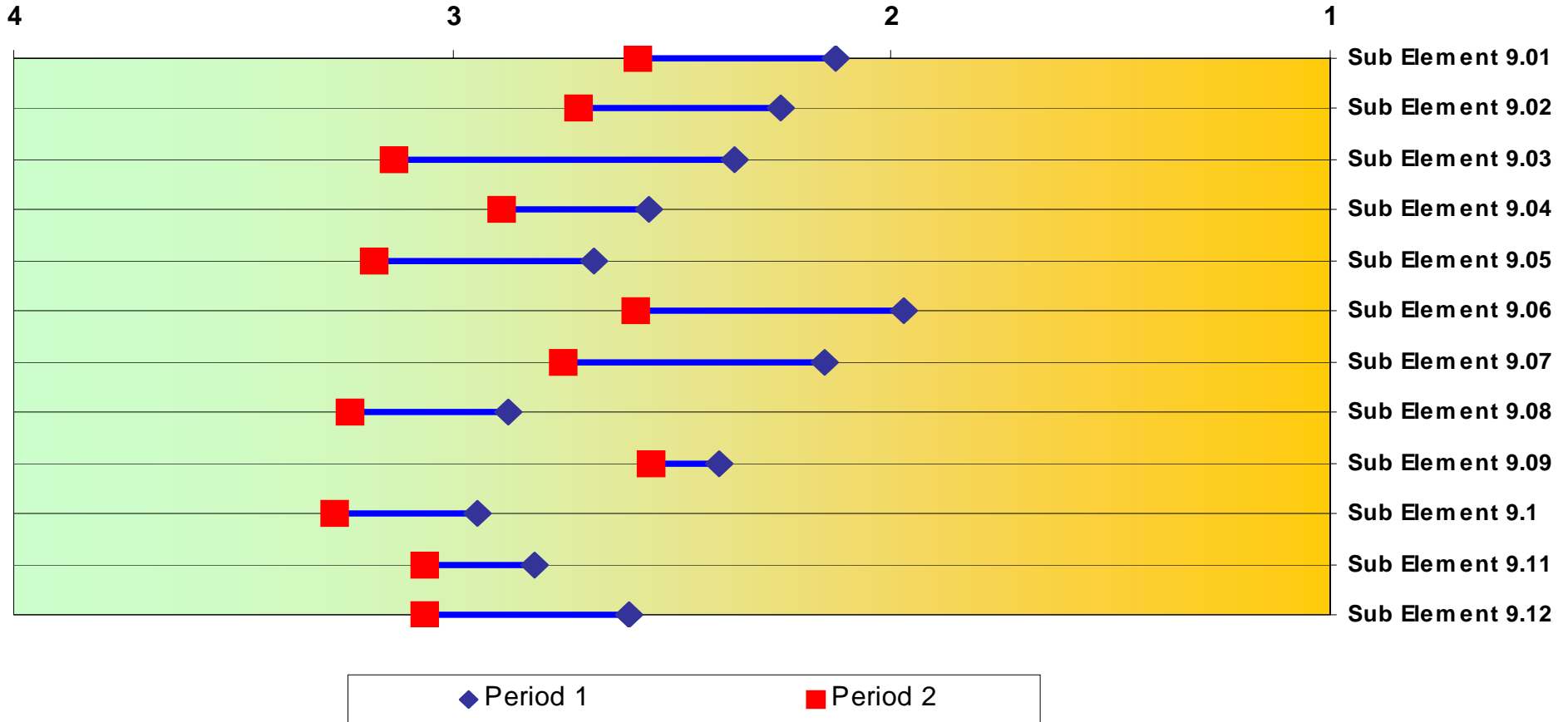
Period 1
 Period 2



Cordero Rojo Maintenance - Best Practice Gap Analysis

Element 9 - Planning and Scheduling

Rating Assigned



Best Practice Sub-Element Number