THE MINE MANAGEMENT OPERATING SYSTEM:

A FOUNDATION FOR SUCCESS

CONTENTS

INTRODUCTION

Most world-class mining operations are increasingly utilizing data, actionable information, and timely communications for improved decision-making. This is a precondition for achieving higher levels of performance.

Given the complexity of the asset bases — human, equipment, and mineral — as well as safety, health, environmental, supply chain, maintenance, and support services, it is critical that organizations have a clearly defined Mine Management Operating System (MMOS).

The MMOS is the foundational structure that supports closed-loop information dissemination for decision-making within the organization.

A basic MMOS consists of planning, scheduling, communication, execution and follow-up, report and review, and the continuous improvement process. Achieving this requires a balanced focus on three elements:

➤ **TACTICAL:** system reviews, employee involvement, skills development

➤ **TECHNICAL:** resource planning, strategic sourcing, continuous improvement

➤ **TECHNOLOGY-BASED TOOLS:** (ERP, BI, CMMS, etc.) to fill gaps and disconnects in the operating system, provide a rapid and more sustained rate of improvement, and result in an upgrade to organizational capability

MINE MANAGEMENT OPERATING SYSTEM BASICS

A driving force that sets world-class mining operations apart from their peers is a well-defined and well-executed MMOS.

SYSTEMS	PROCESSES	SUBPROCESSES
SAFETY MOS	PLANNING	LIFE OF MINE PLAN
FINANCIAL MOS	SCHEDULING	ANNUAL PLAN
MINE PRODUCTION MOS	COMMUNICATIONS	RESOURCE CAPACITY PLAN
PLANT PRODUCTION MOS	EXECUTION & FOLLOW-UP	QUARTERLY PLAN
MAINTENANCE MOS	REPORT AND REVIEW	MONTHLY PLAN
SUPPLY CHAIN MOS	CONTINUOUS IMPROVEMENT PROCESSES	WEEKLY SCHEDULE
		DAILY/SHIFT SCHEDULE

*The systems illustration shown above are not intended to be a fully inclusive list.

IDENTIFYING GAPS AND OPPORTUNITIES IN YOUR MANAGEMENT OPERATING SYSTEM (PART 1)

A well-designed, maintained, and properly executed MMOS will flag gaps and opportunities as they begin to appear.

Most often though, what is not obvious is exactly where those gaps and opportunities exist.
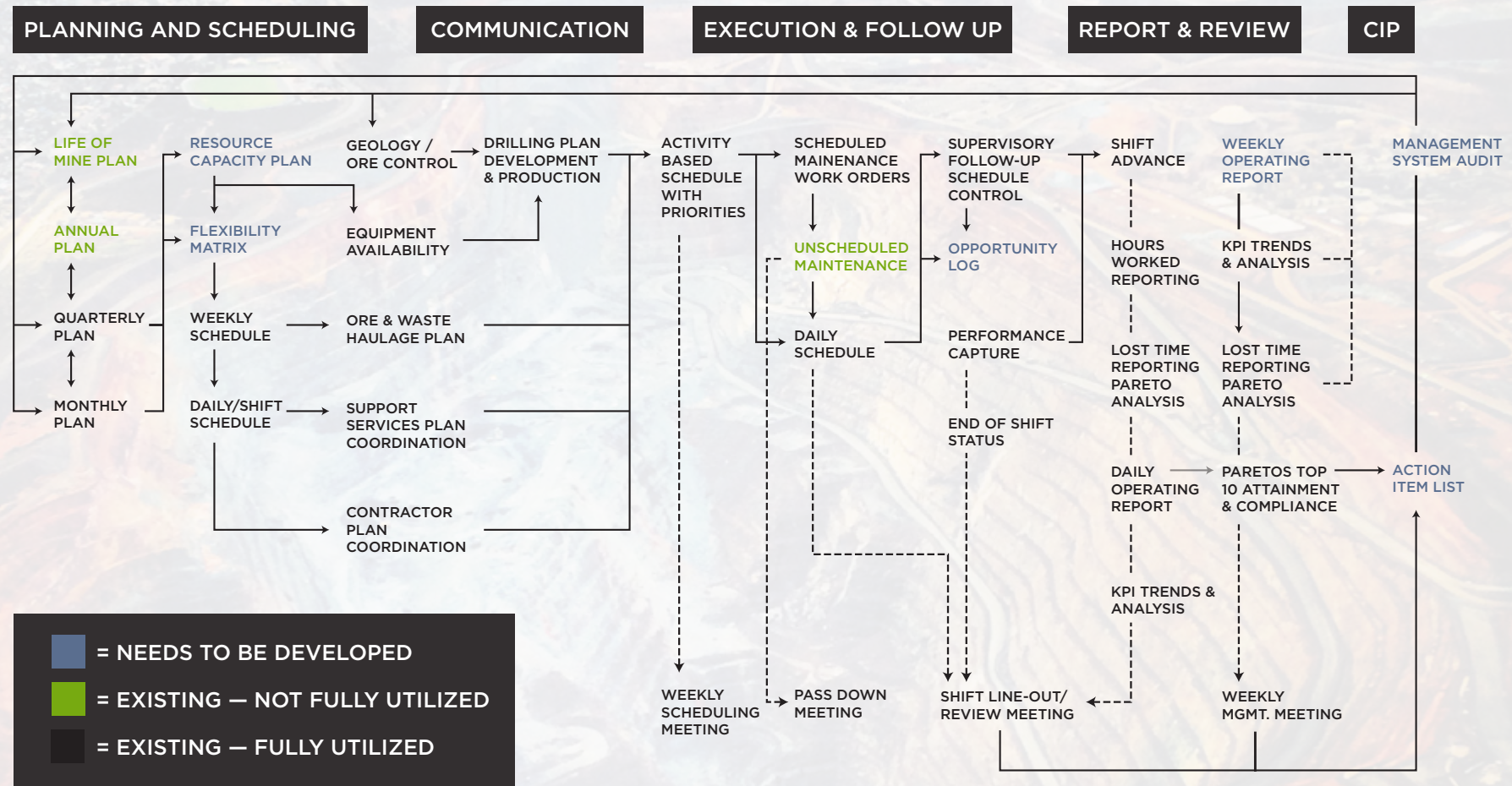
Gaps and opportunities can be the result of personnel changes, new asset introductions without required MMOS modification or a lack of discipline in adhering to defined processes.

Given an organization's resources are busy operating and managing the business, identifying these gaps and opportunities can be a tall order.

Without a structure to guide the reviews, highlight flaws, and orchestrate corrective actions, performance gaps can continue to widen and opportunities will be missed.

IDENTIFYING GAPS AND OPPORTUNITIES
IN YOUR MANAGEMENT OPERATING SYSTEM (PART 2)

| PLANNING AND SCHEDULING | COMMUNICATION | EXECUTION & FOLLOW UP | REPORT & REVIEW | CIP |

LIFE OF MINE PLAN
RESOURCE CAPACITY PLAN
GEOLOGY / ORE CONTROL
DRILLING PLAN DEVELOPMENT & PRODUCTION
ACTIVITY BASED SCHEDULE WITH PRIORITIES
SCHEDULED MAINENANCE WORK ORDERS
SUPERVISORY FOLLOW-UP SCHEDULE CONTROL
SHIFT ADVANCE
WEEKLY OPERATING REPORT
MANAGEMENT SYSTEM AUDIT

ANNUAL PLAN
FLEXIBILITY MATRIX
EQUIPMENT AVAILABILITY
UNSCHEDULED MAINTENANCE
OPPORTUNITY LOG
HOURS WORKED REPORTING
KPI TRENDS & ANALYSIS

QUARTERLY PLAN
WEEKLY SCHEDULE
ORE & WASTE HAULAGE PLAN
DAILY SCHEDULE
PERFORMANCE CAPTURE
LOST TIME REPORTING PARETO ANALYSIS
LOST TIME REPORTING PARETO ANALYSIS

MONTHLY PLAN
DAILY/SHIFT SCHEDULE
SUPPORT SERVICES PLAN COORDINATION
END OF SHIFT STATUS

CONTRACTOR PLAN COORDINATION
DAILY OPERATING REPORT
PARETOS TOP 10 ATTAINMENT & COMPLIANCE
ACTION ITEM LIST

KPI TRENDS & ANALYSIS

Legend:
= NEEDS TO BE DEVELOPED
= EXISTING — NOT FULLY UTILIZED
= EXISTING — FULLY UTILIZED

WEEKLY SCHEDULING MEETING
PASS DOWN MEETING
SHIFT LINE-OUT/ REVIEW MEETING
WEEKLY MGMT. MEETING

*Subprocesses may vary

OPPORTUNITIES IN MINING CYCLE ACTIVITIES
(PART 1: ATTAINMENT TO THE MINING CYCLE ACTIVITY STANDARD)

DRILL → **SCALE/ SUPPORT & CLEAN UP** → **LOAD & BLAST** → **SCALE & CLEAN UP** → **LOAD & HAUL** → **PATTERN/ FACE PREP**

MINE TO MILL INTERFACE

PROCESSING PLANT

USC Consulting Group believes that identifying, understanding, and correcting the root cause(s) of the erosion of attainment for mining activity standards is fundamental to sustainably improving performance.

OPERATIONAL ISSUES
> Operator and miner variability in techniques applied
> Consumables availability at point of use

NONOPERATIONAL ISSUES
> Mechanical downtime
> Supply chain performance

OPPORTUNITIES IN MINING CYCLE ACTIVITIES
(PART 2: REDUCE OR ELIMINATE DELAYS BETWEEN MINING ACTIVITIES)

DRILL — DELAY — SCALE/ SUPPORT & CLEAN UP — DELAY — LOAD & BLAST — DELAY — SCALE & CLEAN UP — DELAY — LOAD & HAUL — DELAY — PATTERN/ FACE PREP — DELAY — MINE TO MILL INTERFACE — DELAY — PROCESSING PLANT
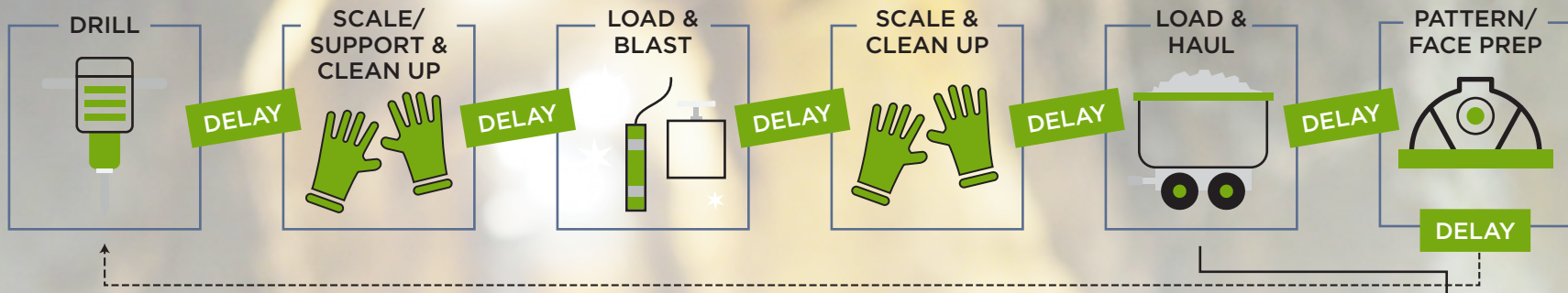
Parallel with achieving mining activity standards, the identification and reduction or elimination of delays in the mining cycle are critical for continuous improvement in performance.

OPERATIONAL ISSUES

➤ Manpower and equipment scheduling

➤ Reprioritizing activities

➤ Consumables availability at point of use

NONOPERATIONAL ISSUES

➤ Mechanical downtime

➤ Infrastructure/services

➤ Supply chain performance
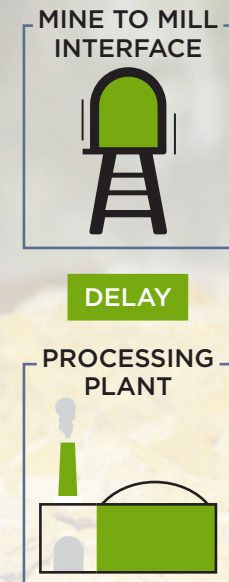
WHO WE ARE

With over 50 years of experience in mining and metals, USC Consulting Group has been there — on or under the ground with the miners.

Whatever your challenge — open pit, underground, room and pillar, narrow vein, mill and plant operations — we are the people who help the talent you already have blossom into its full potential.

We locate waste, redundancies and ineffective processes, then rapidly recover these opportunities and convert them to improvements in operating profit by improving the skill sets of all levels of management. Our experts embed with internal teams to develop, enhance, and implement management operating system improvements as a means to drive, sustain and perpetuate change in how you plan, schedule, assign work, execute, follow-up and report. In short, we implement change that drives financial improvements.

OUR PHILOSOPHY (PART ONE)

➤ Safety is never compromised.

➤ Changes in an organization must be led from the top down, but lasting change is sustained only by engaging the workforce from the bottom up.

➤ We look across the site/operation/organization to create a prioritized list of opportunities based on potential value, but change needs to come at the right pace so as not to overwhelm the organization. Implementation of change requires a phased approach.

➤ The Employee Involvement Prototype Process is at the core of our implementation methodology. Begin with a very focused process at the point of execution in some part of the operation, gain success, celebrate and then expand.

➤ Identifying the reasons for the existence of waste and lost time requires input from the employees who are at the point of execution. This is the key to having a continuous improvement process that will perpetuate. A management operating system must be designed to tell on itself.
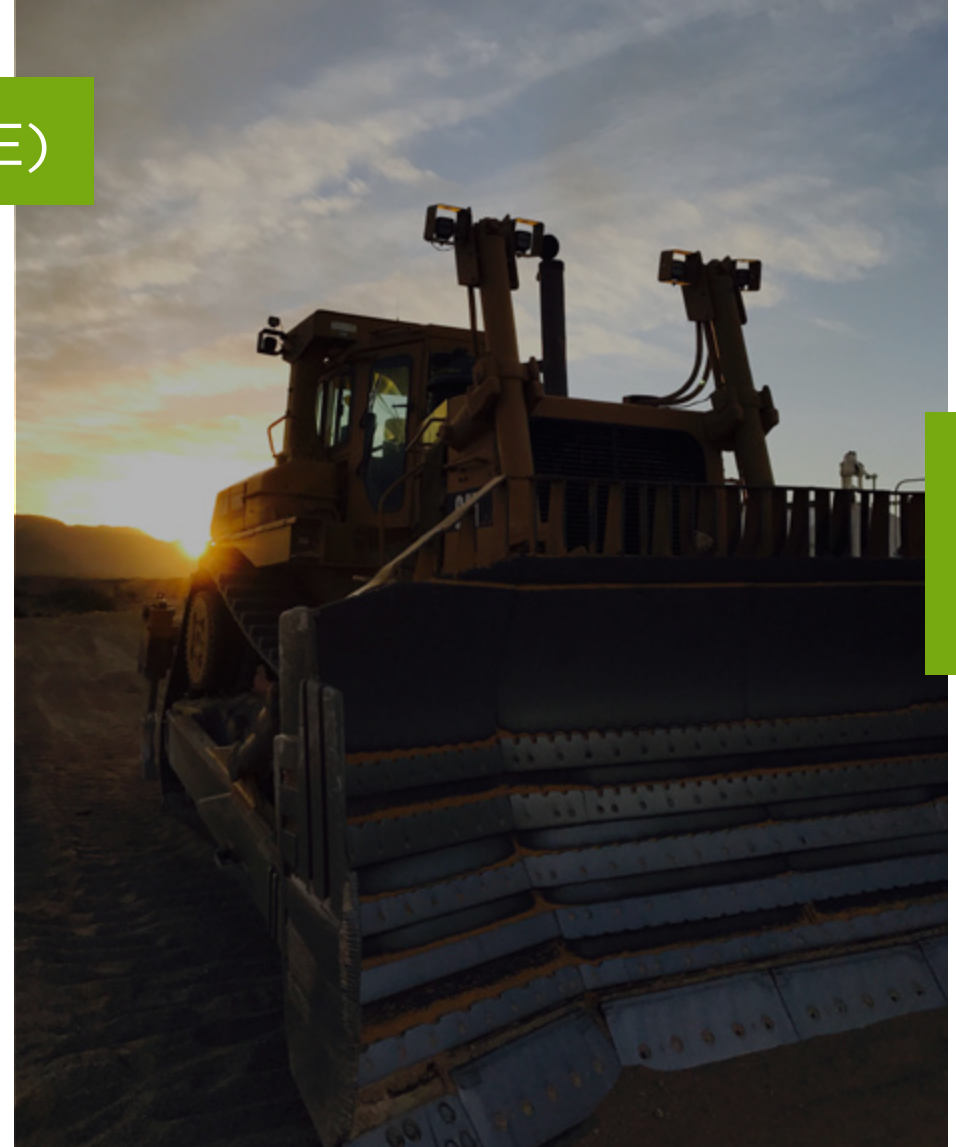
OUR PHILOSOPHY (PART TWO)

➤ In order for us to be an effective catalyst and facilitator to help implement change, we must be engaged with your people at the point of execution: working alongside them, treating them with respect, and gaining their buy-in to the findings as well as their willingness to change how work is planned and performed.

➤ Effective resource capacity planning for assets and employees must be activity based, not built on ratios, history, and averages.

➤ We firmly believe that you cannot manage a process well without good measurement. All projects with our clients must have well-defined milestones and mutually agreed-upon measurable benefits.

➤ By understanding your technical limits for a process, you can set realistic goals to improve, then automate once those improvements add value.

➤ We do request that each project have a steering team comprised of client and USCCG senior management. This team will meet to assess progress, address challenges, perform any necessary course corrections, and always conclude with a summary slide and discussion on how are we tracking on the agreed deliverables and timeline.

Contact USC Consulting Group to speak to our many industry experts and discover the best, most efficient methods for strengthening asset reliability at your facility.

USC CONSUL+ING GROUP™

Empowering. Performance.

+1 800.888.8872 | info@usccg.com

3000 Bayport Drive, Suite 1010

Tampa, FL 33607