San Francisco, CA
Workforce Reliability Workshop:
Developing Workforce; Managing Knowledge
Get Them; Train Them; Retain Them; Drain Them

Workforce Strategies at Littleton/Englewood WWTP:

• Recruitment/Retention Strategy
• Training
• Knowledge Management
L/E WWTP in 1977
Littleton/Englewood WWTP

- 2007 US EPA Industrial Pretreatment Award
- 2006 US EPA O&M Award
- 2003 US EPA Biosolids Award
Post Phase 2 Project - 2010
Service Area
(108 square miles, 20 sanitation districts)
San Francisco Goals

• Get enough of the right people in mission-critical job categories;
• Provide staff with the information they need to do quality work;
• Modify work processes to optimize the use of staffing available; and
• Increase the cost-effectiveness of workforce development investments through collaboration.
Did You Know?

WERF estimates that with the looming departure of senior personnel, utilities will lose an estimated 80% of knowledge that is tacit, that is, understood but not documented.

In the water/wastewater field:
- The average age at retirement is just over 56 years
- The average length of employment at the same facility is 24 years
L/E WWTP Years of Service Average

- >25 Year Avg
- 10 to 25 Year Avg
- <10 Year Avg

Pie chart showing the distribution of years of service.
L/E WWTP Years of Knowledge

- >15 Years Total: 268 Years
  - 7 Years Avg
- <14 Years Total: 953 Years
  - 27 Years Avg
Operations Division Seniority

- >25 Years: 31 year avg
- 10 - 25 Years: 17 year avg
- <10 years: 4 year avg
Operations Division
Knowledge by Seniority

- 54 years
  - Total
  - 6 years avg

- 458 years
  - Total
  - 29 year avg

- >15
- <14
Millennials to the Rescue!

- Millennials (1980 - mid 1990s)
- Fewer Millennials than Boomers & Gen X
- Millennials expect to stay in one job for just a few years. Their average first job longevity is 1.6 years.
The Challenge

- Retiring Employees
  - Transfer Knowledge
  - Train All
  - Recruit Employees
  - Retain Knowledge
A New Job Every 5 Years?

• We want you to work yourself out of a job every 5 years...

But in our organization!
Career Development as an Organizational Responsibility

Successful Littleton/Englewood WWTP Programs:
- Apprentice Operator Program (Get Them/Train Them)
- Career Path (Retain Them)
- Knowledge Management (Drain Them)
“Watcha Gonna Do When The Well Runs Dry?”
Get Them, Train Them, Retain Them:
Recruiting From a Limited Pool of Plant Operators
Certifications
Registered in Colorado

Total Active Certifications, including collections & distribution in Colorado (all levels) – 8,057 (held by 5,714 operators)

(As of 2009)
Permitted Wastewater Facilities in Colorado

458
A Brief History
Once Upon a Time

✓ January 2001 - Operations staff at 75%
✓ Lead Operator position created
✓ Goal of 50% “A” certified operators at L/E WWTP
Recruitment Challenges

- Attracting candidates with certification and experience -
  - ✓ Salary
  - ✓ Accrued vacation earning
  - ✓ Accrued benefits (medical, etc.)
  - ✓ Retirement plans (vested)

- Local economy
- Recruitment expense
Change in Recruitment Strategy

Shift from certification, life experience and skills approach

To

Recruit for **Attitude** and **Aptitude**

We will teach the skills!
Apprentice Operator Program

I Can Do This!
Program Highlights

- Agreement
- Incentive pay line
- Commitment to education
- Training
- Schedule flexibility
Agreement
Agreement Objectives

- Program goal – minimum 50% “A” Certified Operators
- Contractual expectations
- Skills review
“Incentive” Pay Line
Pay Line Progression

(2011)

Apprentice Plant Operator

- "D" - $53,726 (no certificate)
- "C" - $58,032 (D certificate)
- "B" - $62,670 (C certificate)
- "A" - $67,683 (B certificate)

Plant Operator

- "D" - $53,726 (D certificate)
- "C" - $58,032 (C certificate)
- "B" - $62,670 (B certificate)
- "A" - $67,683 (A certificate)

Lead Operator - $73,091
L/E WWTP Commitment to Education and Training
Cost of College Level Courses
Since Inception
(Tuition only)

$23,160
Training
“Prepared” Resources

- College programs (RRCC)
- WEF multi-media training modules
- Internet resources (ABC study guide)
- Sacramento Self Study Course
In-House Training

- L/E WWTP Infonet - One Stop Shopping for all information
- Staff developed math module
- Mentoring program
“Outhouse” Training

- RMWEA sponsored events
- RMWEA online training
- Local seminars / Workshops
- Commercial seminars
- City sponsored training
As a Colorado Class "D" licensed Operator at the L/E WWTP, you are expected to have the ability to describe the basic operating functions of various components of the wastewater treatment system. In each of the following, summarize the function of the process and describe the key components necessary for its effective operation:

**Headworks**

**Key process components:**

- **Flow measurement:** Complete X Incomplete X
- **Screenings removal:** Complete X Incomplete X
- **Raw sewage pumping:** Complete X Incomplete X
- **Grit removal:** Complete X Incomplete X

Comments: ____________________________________________
Schedule Flexibility to Accommodate Education and Training

- Reschedule days off
- Adjustable hours
- Shift adjustment
Will They Stay?
Next Challenge – “Stay Incentive”

Retaining candidates with experience and certification

✓ Competitive Salary
✓ Accrued vacation
✓ Accrued benefits (medical, etc.)
✓ Retirement plans (now vested)
✓ “Ownership”
✓ Facility recognition
What’s in it for the L/E WWTP?

- “A” wastewater certified operators
- “Ownership” of a successful program
- Contributes to facility recognition
- Operators are specifically trained to L/E WWTP while learning basic wastewater treatment skills
Program Success

15 Individuals Hired into the Program

5 - “A” Certified “Graduates”
1 - “B” Certified Operators
1 - “C” Certified Operators
2 - “D” Certified Operators
6 - Left Program
“Now, Watcha Gonna Do When The Well Is Full?”

- Part 2 -

Developing the Pool
Retain Them; What’s Next?

✓ Retain program graduates?
✓ Culture blending/knowledge transfer?
✓ Improve training structure?
✓ Mentoring program?
✓ Succession planning?
Career Path Drivers

• Life After the Apprentice Program?
  - Agreement
  - Incentive pay line
  - Commitment to education
  - Training
  - Schedule flexibility

• Career Development/Advancement

• Knowledge Transfer/Succession Planning
Tie it Together...

BSD Performance Management

Operations Performance Management

Pay for Performance

Metrics

Knowledge Management Plan

Operations Career Path

Metrics
Proposed Career Path

Operators A-D
Operator advances by completing minimum job description requirements and completing either the state or in-house certification programs.

Technical Lead
Fulfill minimum job description requirements and display key attributes to become eligible for position:
- Proactive
- Self-directed
- Positive Mental Attitude
- Technical Process knowledge
- Strategic Mindset
- Results Oriented
- Involvement with outside agencies
- Positive Leadership
Subjective attributes taken into account for determination of promoting individuals:
- Technical Lead when projects become available
- Supervisory Lead when positions become available

Supervisory Lead

Managerial Supervisor

Project Supervisor
Fulfill minimum job description requirements, key "Lead Attributes", plus the following to become eligible for position:
- Minimum of 3 years of experience as Lead Operator
- Proven track record of managing technical projects and/or employees
- Participated in City Supervisory Training Program
- Special Technical Expertise

Subjective attributes taken into account for determining of promoting individuals:
- Technical Supervisor when programs become available
- Supervisory Lead when positions become available

Facility Management
Supervisor advances by completing minimum job description requirements, position availability, and displaying skills in:
- Strategic Technical Planning
- Ability to Develop Leaders
Lead Operator Special Assignments

- 6 Lead Operators with special assignments
- OMC
- KMT Leader
- Dewatering/Daft Process Area “Supervisor”
- Training/certification Coordination
- Special Project Management
- Training/mentoring
Drain Them

• Littleton/Englewood Wastewater Treatment Plant Knowledge Management Initiative: ‘InfoNet’

Using an Online Manual to Capture Knowledge
The L/E Dilemma

• Retirement of Senior Staff
  - Division Managers, Supervisors, Mechanics, Operators
  - Many Processes and Much Knowledge Not Documented

• New Treatment Plant
  - Everything is New!
  - 1000’s of Standard Operating Procedures (SOP) Needed
The Solution: Electronic O&M Manual

- Management decision to have electronic O&M Manuals, in lieu of shelves of books and binders that cannot be maintained.
- This was a difficult lump of cash for the Board to swallow!
- $150,000.00
What is the new 'InfoNet'?

• Web based system
• Helps to manage the brain drain!
• Provides operational information on each process
• Organizes data into an easily accessible information manager
  - All Standard Operating Procedures (SOPs),
  - Emergency Operating Procedures (EOPs),
  - Alarms, Process Controls, Equipment,
  - Instrumentation, Controls and Design Data
How Does this Affect the Operations Division?

Plant Operators are being asked to develop and review SOP’s and the O&M manual because:

- 1000’s of SOP’s Need to be Developed
- 1000’s of pages of O&M material must be reviewed for accuracy and relevance
- The Operator is the Subject Matter Expert (SME)
- These tasks will take a concentrated effort to complete
Getting Started

• Formed Knowledge Management Team
  - Capture existing knowledge from all experience levels - 2 senior and 2 junior operators, Process Specialist and Data Analyst
  - Just team members developing content
  - Identified SOP’s - where to start
  - Part-time process - development process too slow

• Learning Style Survey
  - [http://www.usd.edu/trio/tut/ts/style.html](http://www.usd.edu/trio/tut/ts/style.html)
Evolution of Knowledge Management Program

• Reassigned Lead Operator to full-time content development
• Knowledge Management Team - annual rotation of team members
• Extending program to all plant divisions
• Challenges:
  - Recognizing trigger events to capture knowledge - produce scenario based training
  - Recognizing participating employees
Development Process

• Identify need (SOP, troubleshooting guide, etc.)
• SOP development is entered into INFOR EAM as a Work Request
• Author assigned: Researches and develops
• Author completes Work Order
• SOP goes to KMT for final review and approval
• SOP entered as PM in INFOR EAM for annual review
• INFOR EAM used to generate reports of hours per SOP
### SOP Template

**Title:** Template to develop your SOP  
**Note:** ELL Check before you save  
**Reminder:** Make sure Font is Verdana 10

<table>
<thead>
<tr>
<th><strong>Field</strong></th>
<th><strong>Details</strong></th>
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</thead>
<tbody>
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<td><strong>Name:</strong></td>
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<tr>
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</tr>
<tr>
<td><strong>PM Number:</strong></td>
<td></td>
</tr>
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<td><strong>Area:</strong></td>
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<td><strong>Added Equipment:</strong></td>
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</tr>
<tr>
<td><strong>Description:</strong></td>
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<tr>
<td><strong>Operating Goals:</strong></td>
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<td><strong>Hazard Analysis:</strong></td>
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<tr>
<td><strong>Resources Required:</strong></td>
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<td><strong>Regulatory Requirements:</strong></td>
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<td><strong>Related Tasks:</strong></td>
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<tr>
<td><strong>Added Documents:</strong></td>
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<table>
<thead>
<tr>
<th><strong>Response:</strong></th>
<th><strong>Photograph:</strong></th>
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<tbody>
<tr>
<td></td>
<td></td>
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<tr>
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</tr>
</tbody>
</table>
Standard Operating Procedures (SOPs)

- SOPs
  - Upper portion of SOP includes
    - Description
    - Photo
    - Resources Required
    - Links to other documents
Each step in the SOP is documented using a photograph along with text to ensure the operator can easily perform the SOP.
**KMT Work Request**

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<tr>
<th>Work Order Information</th>
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<tr>
<td>WO Type</td>
<td>Service</td>
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<td>Priority</td>
<td>Routine</td>
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<td>PM Code</td>
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<td>Department</td>
<td>OPLE [ Operations ]</td>
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<tr>
<td>Status</td>
<td>Scheduled</td>
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<td>Project</td>
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<td>Requested By</td>
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<tr>
<td>Sched Date</td>
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<td>Warranty?</td>
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<tr>
<td>Safety?</td>
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<th>Equipment Details</th>
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<tr>
<td>Equipment</td>
<td>BLDG-05 - Building 05 ORT Chemicals</td>
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<td>Primary Location</td>
<td>BUILDING 05 ORT CHEMICAL</td>
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<tr>
<td>Sub Location</td>
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<tr>
<td>Manufacturer</td>
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<tr>
<td>Model</td>
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<tr>
<td>Serial No</td>
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<td>Location Notes</td>
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<td>Delay Reason</td>
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<td>Failure Reason</td>
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<table>
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<th>Activity and Labor Details</th>
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<td>Activity</td>
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<td>Trade</td>
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<td>Supervisor</td>
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<tr>
<td>No of Persons</td>
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**Recommended Materials**

**Instructions and Comments**

**WO Comments**

Please review for contents and pictures. When you have finished your review, mark your activity completed and the last one to complete, mark the WO completed by craft. Reviewed, SOP was easy to follow.
# Open Work Orders Report

## KMT Work Orders

<table>
<thead>
<tr>
<th>WO#</th>
<th>WO Description</th>
<th>Equipment</th>
<th>Date Due</th>
<th>Delay Code</th>
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<tbody>
<tr>
<td>58452</td>
<td>KMT - Review/Edit SOP Manual Sampling Procedures for Quarterly Sampling</td>
<td>BLDG-01</td>
<td>5/18/09</td>
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<tr>
<td>58452</td>
<td>KMT - Review/Edit SOP Manual Sampling Procedures for Quarterly Sampling</td>
<td>BLDG-01</td>
<td>5/18/09</td>
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<tr>
<td>60435</td>
<td>KMT - Create SOP for SBS Pump Keypad Features</td>
<td>P-11-211</td>
<td>6/12/09</td>
<td></td>
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<tr>
<td>38487</td>
<td>KMT - Create SOP for Spill Trailer Monthly PM</td>
<td>85993</td>
<td>12/12/08</td>
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<tr>
<td>39958</td>
<td>KMT - Create SOP for How to recover Boiler Operation</td>
<td>BLR-08-016</td>
<td>4/4/09</td>
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<tr>
<td>68803</td>
<td>KMT - Create SOP SCT Cleaning and standby Status</td>
<td>T-04-130</td>
<td>9/11/09</td>
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<tr>
<td>68801</td>
<td>KMT - Create SOP for DAFT Poly pump alternate operation</td>
<td>P-07-304</td>
<td>9/11/09</td>
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## SOP Review Hours

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<th>DATE WORKED</th>
<th>EMPLOYEE</th>
<th>HOURS WORKED</th>
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<td>KMT - Annual Review SOP Sodium Bisulfite Chemical tanks P-trap Fill Procedure</td>
<td>79462</td>
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<td>GFMARFER</td>
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<td>KMT - Annual Review Taking Barscreen Offline SOP in new Infonet</td>
<td>75004</td>
<td>11/18/09</td>
<td>KHILL</td>
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<td></td>
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<tr>
<td><strong>BUILDING 06 HEADWORKS Total Hours</strong></td>
<td></td>
<td></td>
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<td>0.75</td>
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<tr>
<td>KMT - Annual Review SOP for Hach Hardness Kit Use</td>
<td>77234</td>
<td>12/2/09</td>
<td>KBISH</td>
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<td>77234</td>
<td>12/3/09</td>
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<tr>
<td><strong>BUILDING 06 Headworks Total Hours</strong></td>
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<tr>
<td>KMT - Annual Review SOP Filters Manual Backwash with HMI</td>
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<td>KMT - Annual Review SOP for Hibon Blower Inlet Filter Differential</td>
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<td><strong>BUILDING 08 BLOWER BLDG Total Hours</strong></td>
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<td>MTRUSTY</td>
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<td><strong>BUILDING 09 SSPS Total Hours</strong></td>
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# KMT Total Hours Report

## KMT WQs

Selected Date Range: Jan 1, 2009 - Dec 31, 2009

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<thead>
<tr>
<th>WOS SCHEDULED</th>
<th># COMPLETED ON TIME</th>
<th>COMPLETION PERCENT</th>
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<tr>
<td>205</td>
<td>42</td>
<td>20%</td>
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<tr>
<th>Operator</th>
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<tr>
<td>BPRITEKEL</td>
<td>33.42</td>
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<tr>
<td>DBOLLIG</td>
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<td>DPRICE</td>
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<td>TSOTO</td>
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<tr>
<td>VHEIKEN</td>
<td>46.06</td>
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</table>

**Summary** 670.718
Where we are now

• On-Line Manual
  - Developed to document equipment, controls and instrumentation
  - Just completed upgrade to .net version
  - Fairly static at this point

• Infonet
  - One Stop Information Shop
  - On-going involving multiple plant staff members
  - Knowledge Management
  - Tied into Infor EAM to ensure constant updates and to document time spent
Integrated Information and Control Systems

- Regulatory & Reporting
- Process Control
- Engineering
- Automation & Control
- Knowledge Management
- Enterprise Asset Management
- Operations & Maintenance Manuals & SOPs
- Pretreatment Management
L/E WWTP Software Systems

Facility Systems

• Laboratory Information System (LIMS)
• Plant Operations Data System (PODS)
• Supervisory Control & Data Acquisition (SCADA)
• Flex Ops (Handheld Data Collection)
• Infor EAM (Enterprise Asset Management)
• On-Line Manual (Knowledge Management & SOPs)
• Linko (Pretreatment Software)
Business Network Systems

- Business network and software suite
- Website (LEWWTP.org)
Software System

- LIMS - $176,000
- PODS - $200,000
- SCADA - $2,500,000
- Flex Ops - $25,000
- Infor - $266,000
- On-line Manual - $150,000
  - OLM Upgrade - $59,000
- Linko Pretreatment - $18,000

- Total - $3,394,000
Next Steps

• Succession Planning Program
• Scenario Based Training
Questions?