Asset Management Approach for Wellfields

South Carolina Water Resource Conference

October 15, 2008
Asset Management Approach for Wellfields

1. Overview
2. Asset Management Approach
3. City of Berlin Wellfield
Asset Management Approach for Wellfields

Definition

Inspection, monitoring and maintenance based planning process for maintaining groundwater engineering assets
Asset Management Approach for Wellfields

Short Term Benefit

- Early Recognition of Problem
- Timely Completion of Repair
- More Reliable Service
- Lower Outage Costs
- Cheaper O&M
Asset Management Approach for Wellfields

- Extended Asset Life
- More Efficient Planning
- Reduced Capital Needs

Lower Bond/Debt Costs
Asset Management Approach for Wellfields

Approach

- Well Inventory
- Compile Records
- Assign MEAV
- Condition Assessment
- Performace Monitoring
  - Identify Replacements
  - Identify Rehabilitation
  - Replacement Planning/Impl
  - Rehabilitation Planning/Impl
  - Update Asset Values
Asset Management Approach for Wellfields

Approach

Well Inventory

Assign MEAV

Condition Assessment

Compile Records

Performance Monitoring

Identify Replacements

Replacement Planning/Impl

Update Asset Values

Identify Rehabilitation

Rehabilitation Planning/Impl

Identify Replacements

Compile Records
Asset Management Approach for Wellfields

Well Inventory

• Operational Wells
• Standby Wells
• Wells Awaiting Rehabilitation
• Non-commissioned Wells
Asset Management Approach for Wellfields

- Water Availability
- GW/SW Interactions
- Existing Wells
- Potential Transfers
- New Wells Needed

Regulatory Issues
Asset Management Approach for Wellfields

- Pumps
- Pipes
- Monitoring Controls
Asset Management Approach for Wellfields

Approach

Well Inventory → Assign MEAV → Assess Condition

Performance Monitoring

Well Inventory → Compile Records

Identify Replacements → Identify Rehabilitation

Replacement Planning/Impl → Rehabilitation Planning/Impl

Update Asset Values
Asset Management Approach for Wellfields

Well Records

- Well Construction
- Pump Data
- Initial Development
- Water Quality
- Static Water Level
- Pumping Drawdown
- Inspection Reports
Asset Management Approach for Wellfields

Well Records

- Top of Well (flange): 67.69 m
  - Ground Elevation (Geodetic): 67.17 m
- Diameter: 250 mm (10")
- Elevation (m geod.)
  - High static water level: 50.7
  - Low static water level: 47.0
  - High pumping water level: 48.0
  - Low pumping water level: 42.3
- Pump intake:
  - K packer
  - 0.120" slot screen
  - 0.100" slot screen
  - 0.080" slot screen
- Graphs showing specific capacity (l/min) and remaining water column (%)

Image: Central Compound and Well Head
Asset Management Approach for Wellfields

Approach

Well Inventory → Compile Records

Assign MEAV → Condition Assessment

Performance Monitoring

Identify Replacements → Replacement Planning/Impl

Identify Rehabilitation → Rehabilitation Planning/Impl

Update Asset Values
Asset Management Approach for Wellfields

Approach

- Compile Records
- Well Inventory
- Condition Assessment
- Assign MEAV
- Performance Monitoring
- Identify Replacements
- Identify Rehabilitation
- Replacement Planning/Impl
- Rehabilitation Cost
- Update Asset Values
Asset Management Approach for Wellfields

Modern Equivalent Asset Value (MEAV)

Quantifies an asset’s value by assessing its differences with a reference asset in terms of differences in maintenance and other operating costs even though the two assets may differ in scale/technology and service potential.
Asset Management Approach for Wellfields

Approach

Well Inventory -> Compile Records

Assign MEAV -> Condition Assessment

Performance Monitoring

Identify Replacements

Replacement Planning/Impl

Identify Rehabilitation

Rehabilitation Planning/Impl

Update Asset Values
Asset Management Approach for Wellfields

- Pump Operation/Efficiency
- Yield/Specific Capacity
- Water Quality
- Biofouling/Encrustation
- Mechanical Plugging
- Inspection Opportunities
Reasons for Decline:

- Mechanical plugging in aquifer/gravel pack
- Bacterial deposits in screen, gravel pack or aquifer
- Well construction
- Well development
- Operations
Asset Management Approach for Wellfields

Example Application

Regional District of Nanaimo

Historical Operations - Fairwinds Well 2

- Pumping Rate (gpm)
- Specific Capacity (gpm/ft drawdown)
Asset Management Approach for Wellfields

Approach

Well Inventory

Compile Records

Assign MEAV

Condition Assessment

Performance Monitoring

Identify Replacements

Replacement Planning/Impl

Identify Rehabilitation

Rehabilitation Planning/Impl

Update Asset Values
Asset Management Approach for Wellfields

Well Aging

Identify Replacements

Specific Capacity (gpm/ft-dd)

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Asset Management Approach for Wellfields

Approach

1. **Well Inventory**
2. **Compile Records**
   - **Assign MEAV**
   - **Condition Assessment**

**Performance Monitoring**

- **Identify Replacements**
- **Identify Rehabilitation**

**Replacement Planning/Impl**

- **Rehabilitation Planning/Impl**
- **Update Asset Values**
Asset Management Approach for Wellfields

Well Replacement Costs

- Regulatory Issues - $10,000+
- Land Acquisition - $60,000+
- Site Preparation - $5,000+
- Engineering - $100,000+
- Well Construction/Development - $200,000+
- Infrastructure Work - $300,000+

$675,000+
Asset Management Approach for Wellfields

Approach

Well Inventory

Compile Records

Assign MEAV

Condition Assessment

Performance Monitoring

Identify Replacements

Replacement Planning/Impl

Identify Rehabilitation

Rehabilitation Planning/Impl

Update Asset Values
Asset Management Approach for Wellfields

Clogging Process

Entrance resistance

Partner for progress
Asset Management Approach for Wellfields

Approach

1. Well Inventory
2. Condition Assessment
3. Assign MEAV
4. Performance Monitoring
   - Identify Replacements
   - Identify Rehabilitation
5. Replace Replacements
7. Compile Records
8. Update Asset Values
   - Replacement Planning/Impl.
Asset Management Approach for Wellfields

Well Rehabilitation

- Test
- Mech.
- Video
- Technology
- Extraction

- Monitor
- Removal
- Chemical (If used)
- Video
- Test
Asset Management Approach for Wellfields

Monitor Progress

Sediment Removal Volumes

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Asset Management Approach for Wellfields

Approach

Well Inventory → Compile Records

Assign MEAV → Condition Assessment

Performance Monitoring

Identify Replacements → Replacement Planning/Impl.

Identify Rehabilitation → Rehabilitation Planning/Impl.

Update Asset Values
Asset Management Approach for Wellfields

Update MEAV

New Well Cost – $1,000,000

Debt costs - $100,000 (10% of cost)
Additional Annual Operating Costs for Existing Well - $15,000

Debt Cost of Existing Well - $100,000 - $15,000 = $85,000 per annum or 15%

Updated MEAV of Existing Well - $850,000
Asset Management Approach for Wellfields

City of Berlin, Germany

- 3.5 Million People
- 14 wellfields
- 850 wells
- 160 MGD
- Vertical Wells
- Horizontal Wells
Asset Management Approach for Wellfields

City of Berlin, Well Field

Pump data: Input performance, electrical supply rate, installation number, location
Data maintenance: after purchase, repair

Standard pump management

Current working report

Maintenance report
Data: well and pump activities, details on pump, water meter

Well data: survey year built, well function, construction material, screen length, current building condition features

Standard well management

Current well production and performance data

Well production data: watermeter status, operation hours, water level, pump operation data
## Berliner Wasser Betriebe

**B e r i c h t**

über Leistung, Betriebsstunden und Absenkung der eigenbewirtschafteten Brunnen

der Galerie Tegelort Süd für den Zeitraum 09.09.98 bis 21.04.1999

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Asset Management Approach for Wellfields

City of Berlin, Well Field

Spec. Capacity in m³/h/m

with Well Services

without Well Services

In Berlin 5 years

“Life” Time

KLEINFELDER

Bright Minds. Bright Solutions.
Asset Management Approach for Wellfields

City of Berlin, Well Field

Planning/Design

Operational Data

Economic Conditions

Maintenance & Investment Plan

Submersible Pump Management

Continued Monitoring

No Action Required

Rehabilitation

Drilling of New Wells

Rehabilitation Costs

Maintenance Costs

New Borehole Costs

Rehabilitation Costs

Maintenance Costs

New Borehole Costs
### Asset Management Approach for Wellfields

#### City of Berlin, Well Field

**Well Condition Ranking**

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**Risk Categories**

1. **Routine Monitoring**
2. **Priority Inspection**
3. **Rehabilitate**
4. **Replace**

**Specific Capacity (gpm/ft drawdown)**

- **Date**: Jan-99 to Aug-Sep-05
- **Pumping Rate (gpm)**: 0 to 180
- **Historical Operations**: Fairwinds Well 2
Asset Management Approach for Wellfields

Summary

- Proactive Management of Groundwater Assets Saves Money
- Inspection/Monitoring Based Approach to Assess Well Condition
- Successful Management Requires Planned Maintenance & Assessment of Risk
Asset Management Approach for Wellfields

Questions