WELL RECONDITIONING

AWWA 2015 ANNUAL CONFERENCE

September 2015

HANSEN ALLEN & LUCE INC.

True Story:

Water Supplier Loses 3 Large Production Wells, Abandons Sites

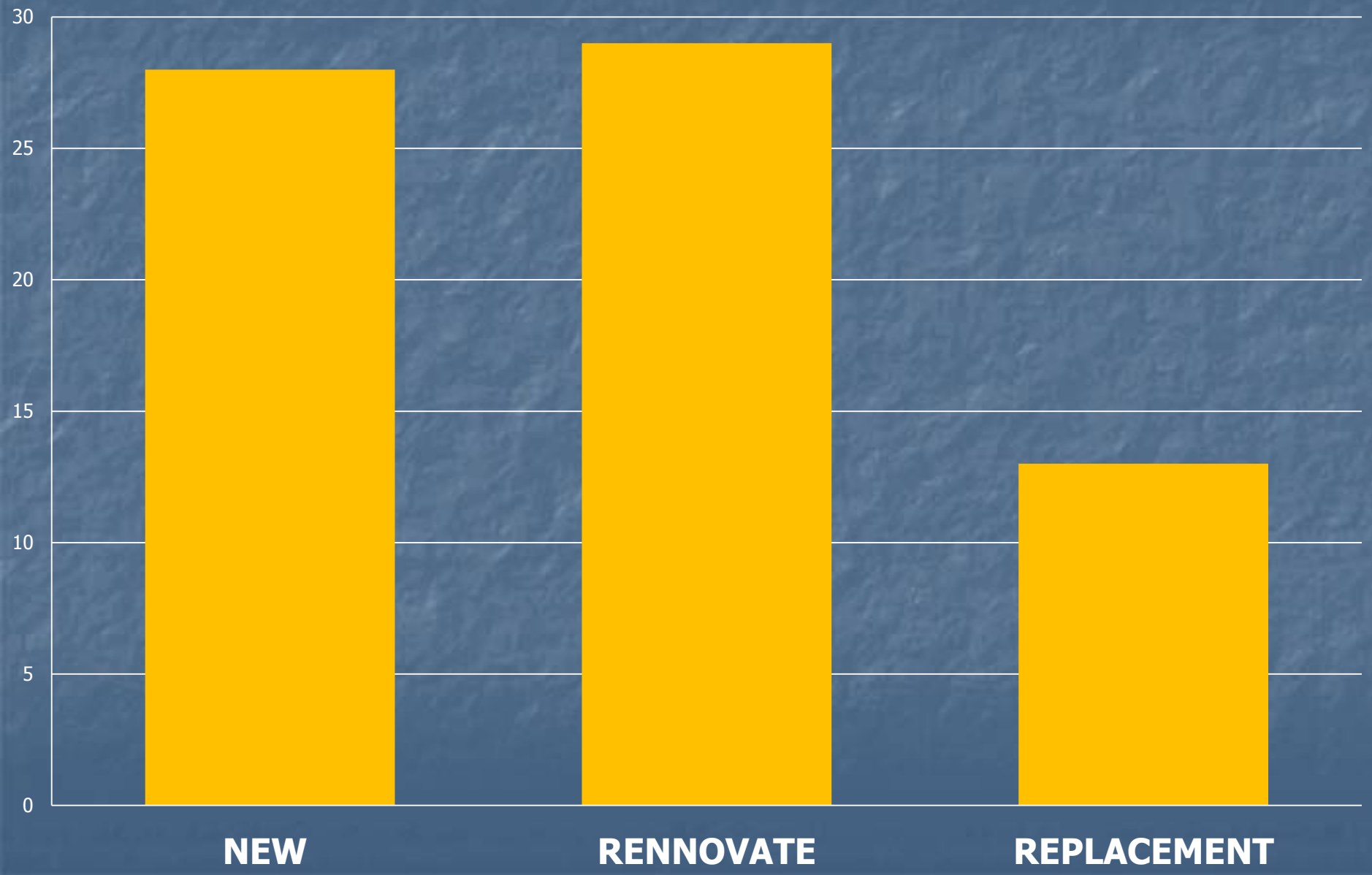
How Much Does A New Well Cost?

Land Purchase
+ Water Rights
+ Well Drilling Cost
+ Pump Station
+ Power Supply
+ Water Delivery Pipelines
+ Drainage Arrangements
+ SCADA
+ Telemetry
+ Water Quality Sampling Program

Total Cost of New Well: $!!!!!!!!!!!

Well Reconditioning Makes Sense

Utah Production Wells Statistics 2014



Well Reconditioning Successes

Heavy Sand Production

Drop in Water Production

Biofouling

- Hard Encrustation Inside Casing
- Aquifer Plugging In & Outside Casing

Well Casing Failure due to Bulge or Collapse

Well Casing Holes or Perforations

Change in Water Quality

How Much Does Well Reconditioning Cost?

Case 1 - $ 8,000

Case 2 - $ 25,000

Case 3 - $ 80,000

Case 4 - $ 350,000

Case History #1 - 16” Well 880 Feet Deep

1997: Yield 800 gpm

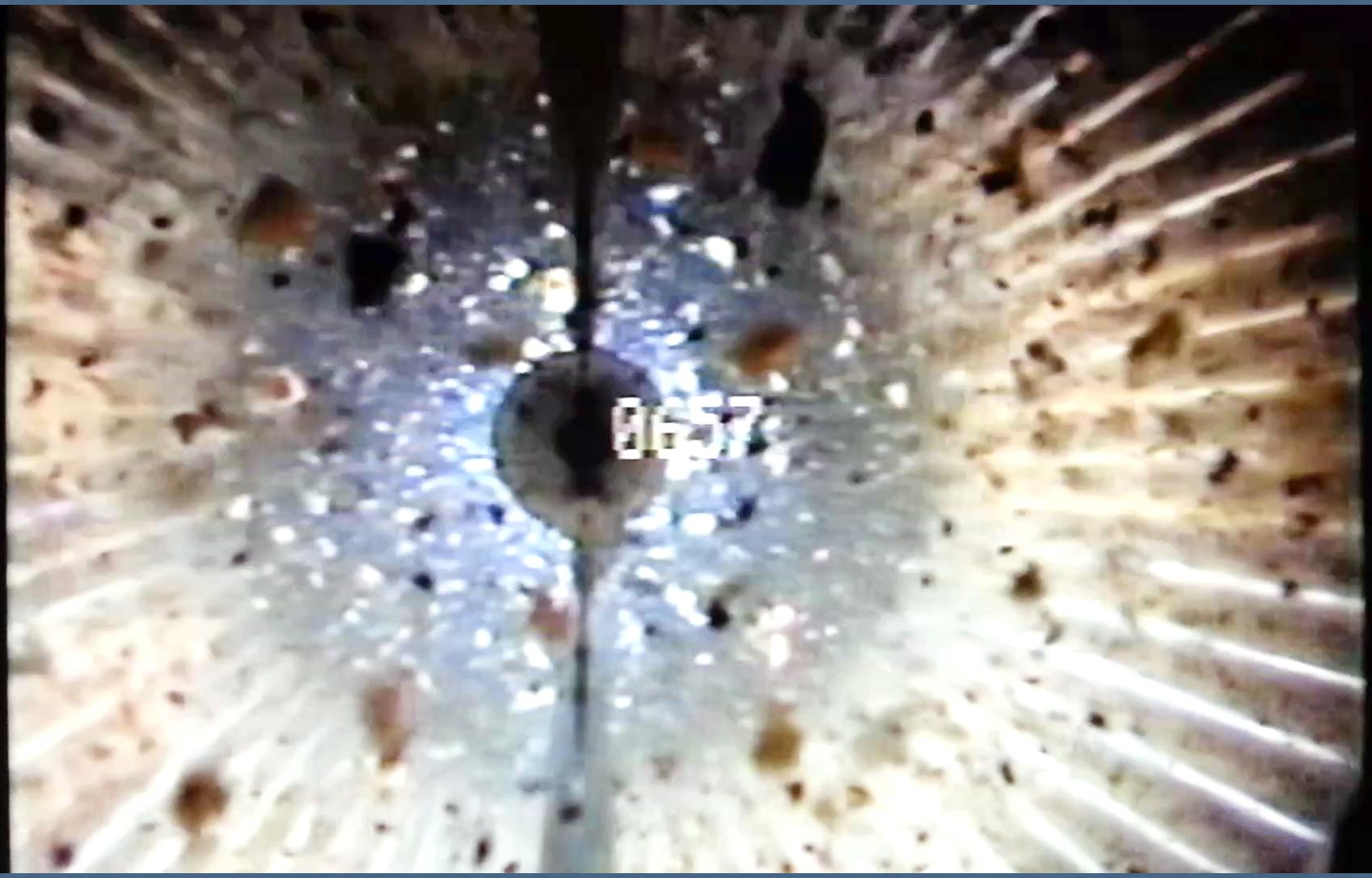
2001: Yield 400 gpm

Problem: Heavy Biofouling

Reconditioning: Chemical Treatments

Cost: $100,000 (2012) to $ 8,000 (2014)

Results: Restoration of 800 gpm Yield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Case History #2 - 20” Well 920 Feet Deep

Problem: Heavy Sanding

Reconditioning: Well Video w/ Pumping, Install Well Casing Patch to Seal Screen

Cost: About $ 25,000

Results: Sanding Eliminated

Little or No Impact to Well Yield

Case History #3 - 16” Well 310 Feet Deep

Yield: 1,350 gpm

Problem: Heavy Sanding and Ground Subsidence Due to Sand Production

Reconditioning: Liner with Gravel Pack

Cost: $ 130,000

Results: Yield 1,400 gpm; No Sand

Case History # 4 - 12” Well 490 feet deep

2006: Original Yield: 700 gpm w/ 6 ppm sand

2014: Yield 100 gpm

Problem: Drought; Aquifer Dropped 75 Feet; Heavy Sand Production

Reconditioning: Deepening, Liner & Gravel Pack

Cost: $ 350,000

Results: Yield 500 gpm w/ 2 ppm sand

Decline in Well Yield

- Well Perforations/Screens Plugging
- Pump Wearout
- Aquifer Water Level Drop

Sanding

- Well Perforations/Screens Plugging
- Incomplete Well Development

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Check Well Efficiency First

Q: How Do You Measure Well Efficiency?

A: Specific Capacity

$$\frac{\text{Well Production}}{\text{Water Level Drawdown}}$$

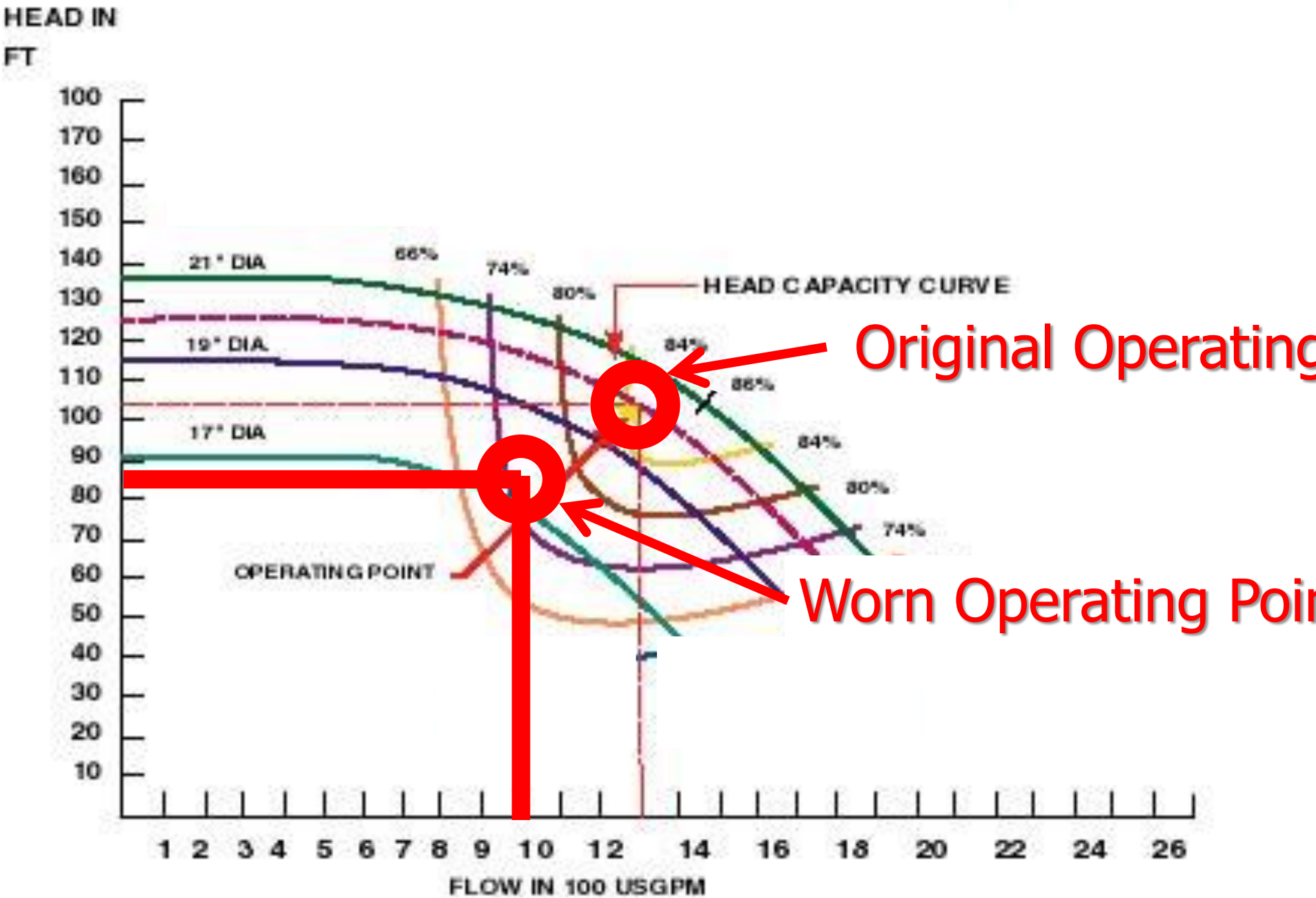
Example: Change in Well Efficiency Over 5 yrs

2004	2009
2,000 GPM	1,700 GPM
68 Ft Drawdown	85 Ft Drawdown
SC = 30	SC = 20

Increase in Pumping Costs

- 2004 Cost/Acre Foot = $ 16.25
- 2009 Cost/Acre Foot = $ 21.04
- Annual Production = 2,971 AF
- Annual Increased Cost = $ 14,231

Check for Pump Wearout


HEAD IN FT
100
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
21" DIA
19" DIA
17" DIA
66%
74%
80%
84%
86%
84%
80%
74%
HEAD CAPACITY CURVE
OPERATING POINT
Original Operating
Worn Operating Poi
1 2 3 4 5 6 7 8 9 10 12 14 16 18 20 22 24 26
FLOW IN 100 USGPM

Check Aquifer Water Level Drop

- Water Rights
- Regional Conditions
- Competent Assistance
- Long Term Consequences
- Water Supply Portfolio
- Plan Response Carefully

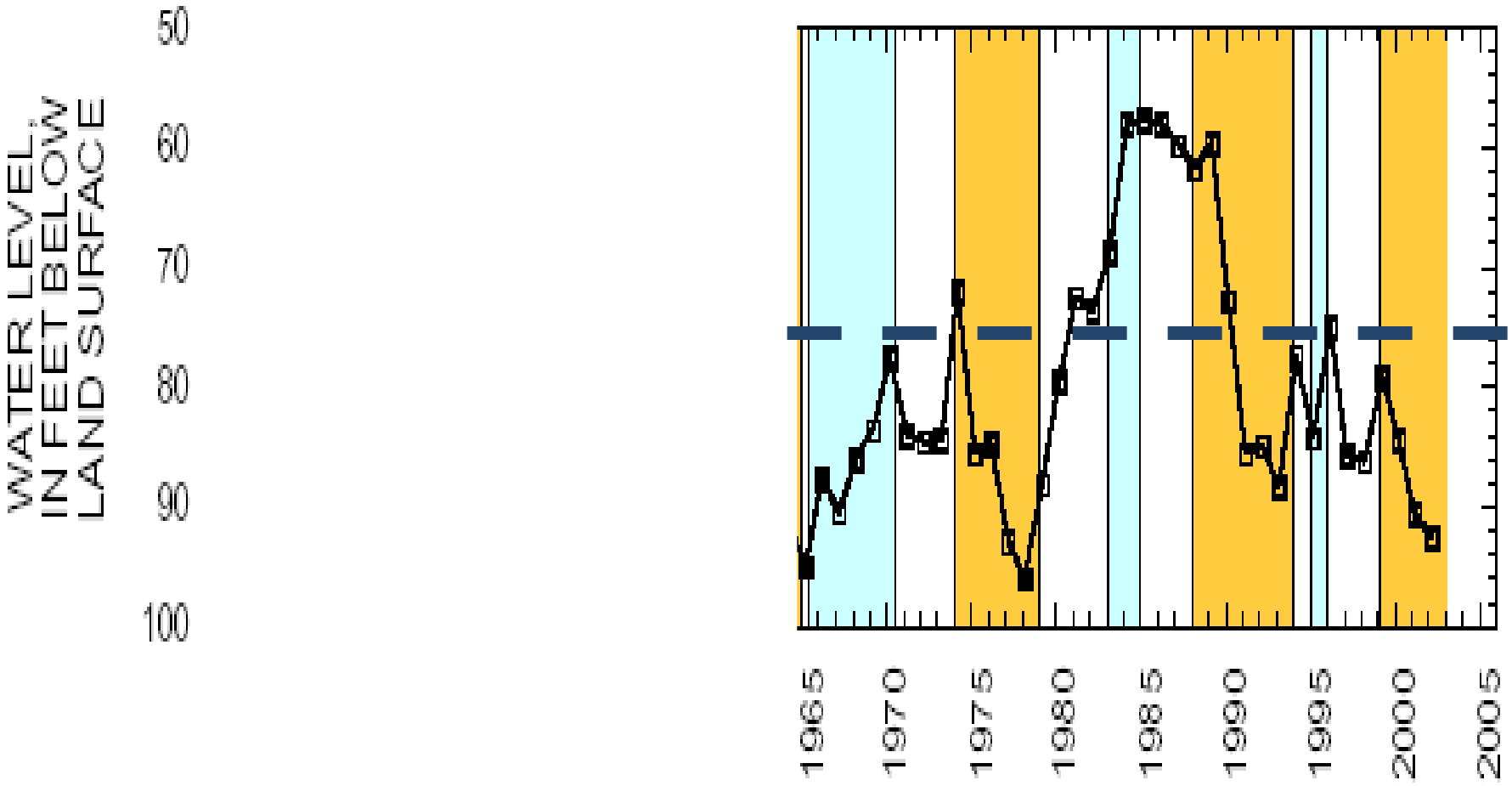


Figure 7. Water levels in a well near Cedar City, Utah.

Source: USGS

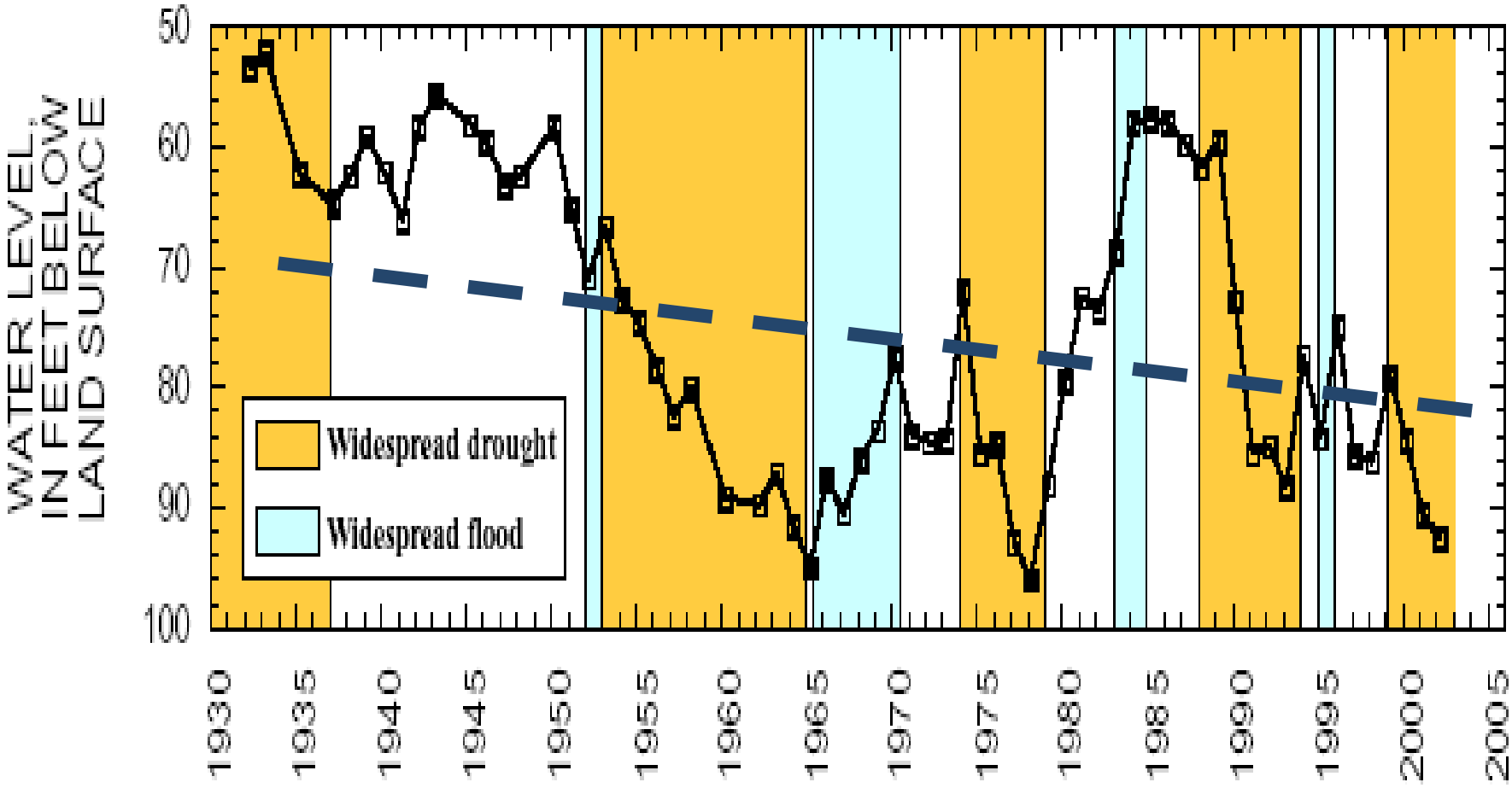


Figure 7. Water levels in a well near Cedar City, Utah.

Source: USGS

Look at Big Picture Issues!

SANDING

- Diagnose the Problem Accurately
- Select an Effective Response

Causes of Sanding

- Clogging of Screens or Perforations by Biofouling or Encrustation
- Drop in Aquifer Water Levels
- Incomplete Well Development

Biofouling/Encrustation

Biological Growth/Encrustation is a Localized Occurrence

Causes of Biofouling

High Dissolved Mineral Content

Iron, Manganese, H_2S

Leftover Phosphates From Well Development

Summary

- Well Reconditioning is Usually Less Expensive than Drilling a New Well
- You Can in Many Cases Recondition a Well to Original Performance

Questions