Surface Mining...

.... Dragline Methods

History of Draglines

- ✔ First dragline built in 1904 by Page & Schnable
- ✔ Built for a specific need on the Chicago Drainage Canal project
- ✔ In 1912, Page Engineering Company incorporated when Page discovered building draglines more profitable than contracting

History, continued

- ✔ Up until 1912 no one had developed a means of propelling the machine
- ✔ In 1913 an engineer for Monighan Machine Company revolutionized dragline by placing two shoes, one on each side of the revolving frame
- ✔ The Model 1-T became the first walking dragline

History, continued

World's Largest Machines

- ✔ 1935 12 CY manufactured by Bucyrus Erie
- ✔ 1942 30 CY manufactured by Marion
- ✔ 1961 40CY manufactured by Ransom & Rapier (British)
- ✔ 1963 85 CY manufactured by Marion
- ✔ 1965 145 CY manufactured by Marion
- ✔ 1969 220 CY manufactured by Bucyrus Erie

History, continued

World's Largest Machines

- ✔ **BIG MUSKIE**
- ✔ Muskinghum Mine of Central Ohio Coal Company (AEP)
- ✔ Operated until June 1991
- ✔ Attempting to preserve as a public historical facility

History, continued

- ✔ Today only two remaining manufactures of draglines:
  - **Bucyrus Erie**
  - **P & H**

History of Dragline Operations in West Virginia

- Joe Hughes of Northeast Mining Company operated a 4 yard Page near Beaver Creek in Tucker County in 1963
- During late 1960's and 1970's several operations including:
  - Imperial Coal & Construction Co.
  - Grant County Coal Corp.
  - Byron Construction Company
  - Bitner Mining
  - Island Creek Coal

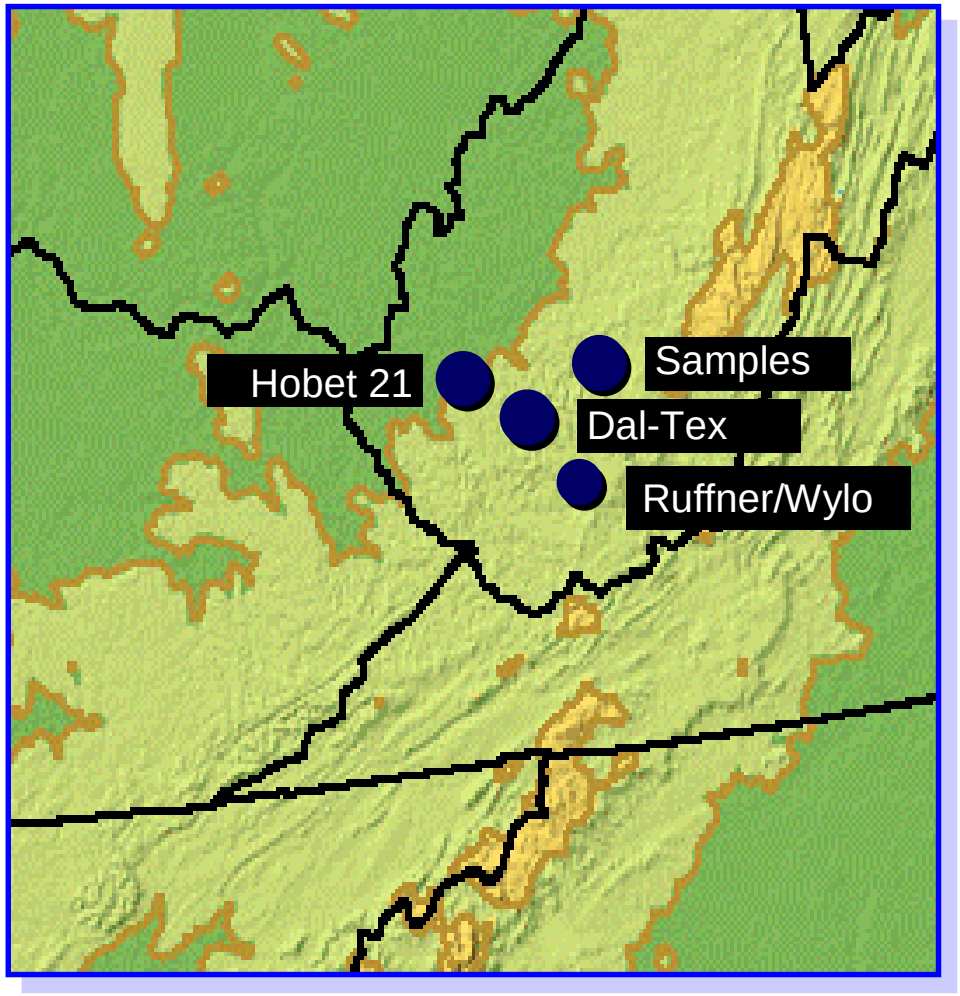
History of Dragline Operations in West Virginia

- 1983 Hobet Mining began operations with a BE 1570 - 80 CY dragline at Hobet 21 near Madison
- 1983 Taywood Mining operated a Marion 183M - 9 CY
- 1987 Hobet Mining installed Marion 8200 - 72 CY machine at the Hobet 07 operations (transferred to Dal-Tex in August 1996)
- 1989 Morrison Knudsen began contract mining operations at Cannelton with a Marion 8200 - 72 CY
- 1989 AOWV/Ruffner added Marion 8400 - 49 CY machine
- 1994 Catenary Coal Company installed a BE 2570 - 100 CY machine at the Samples Mine (upgraded 1998 to 118 CY)
- 1998 Evergreen Mining comissioned a BE 1570 - 75 CY machine in Webster County

History of Draglines Operating in West Virginia

- ✔ 1999 - 6 draglines in operation:
  - BE 1570 at Hobet 21 Mine
  - Marion 8400 at AOWV/Ruffner Mine
  - Marion 8200 at Dal-Tex Mine
  - BE 2570 at Catenary/Samples Mine
  - Marion 8200 at Cannelton Mine
  - BE 1570 at Evergreen Mine

West Virginia Dragline Operations
Arch Coal, Inc.

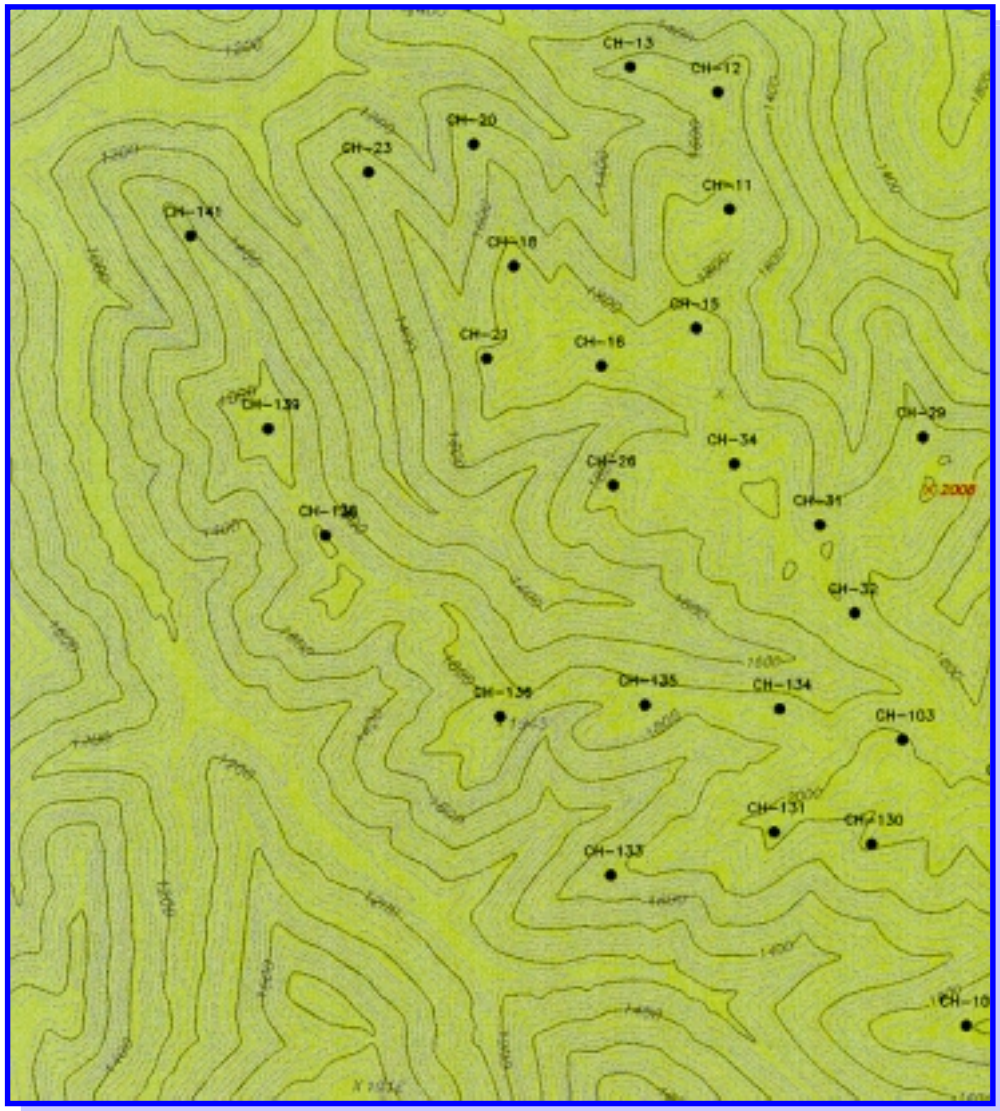


Mine Planning..

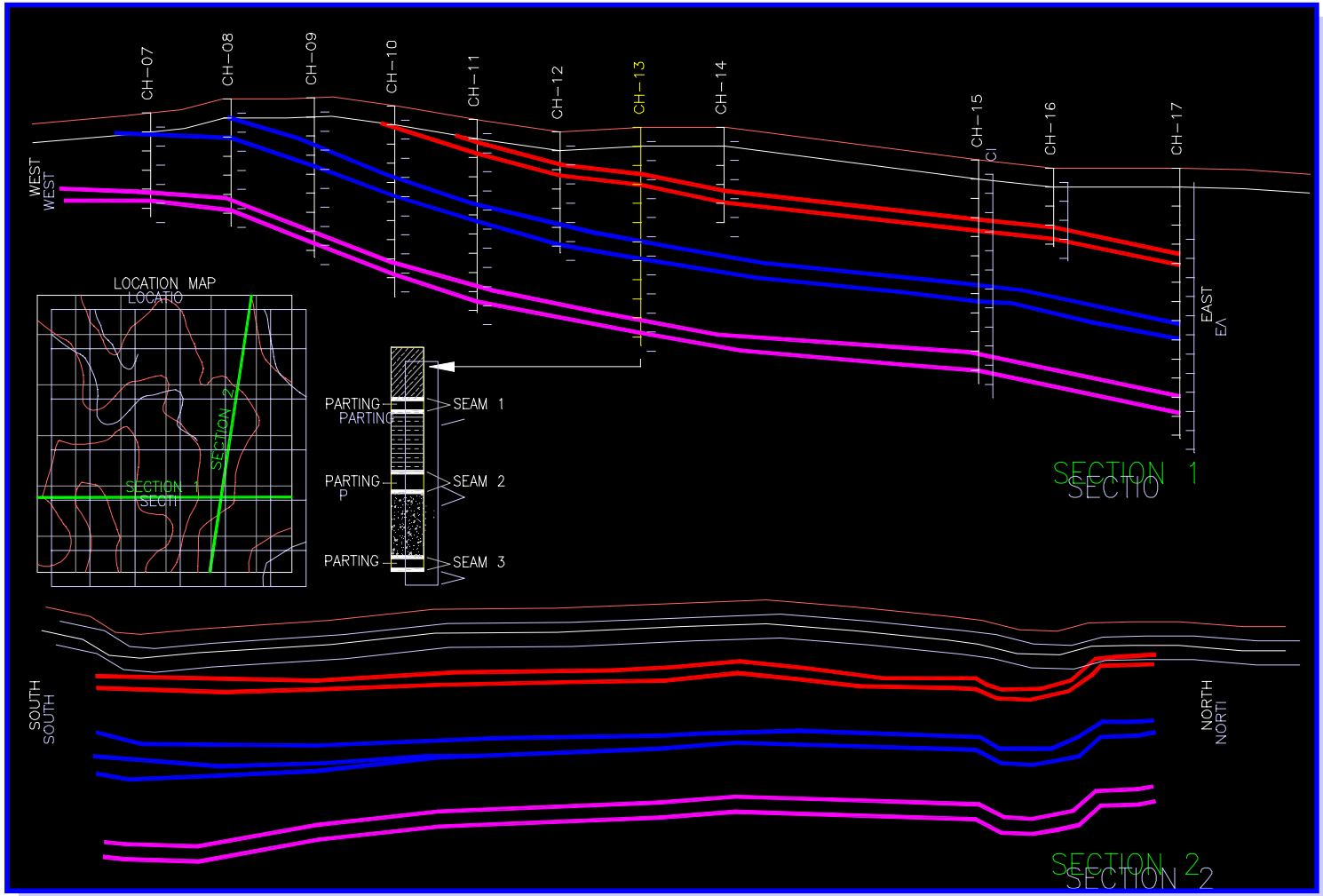
General Considerations in WV

- ✔ Topographical constraints
- ✔ Pit geometry (length/width/bench height)
- ✔ Need for added mobility of machine
- ✔ Single vs. multiple seam
- ✔ Development requirements
- ✔ Contemporaneous reclamation
- ✔ Economics

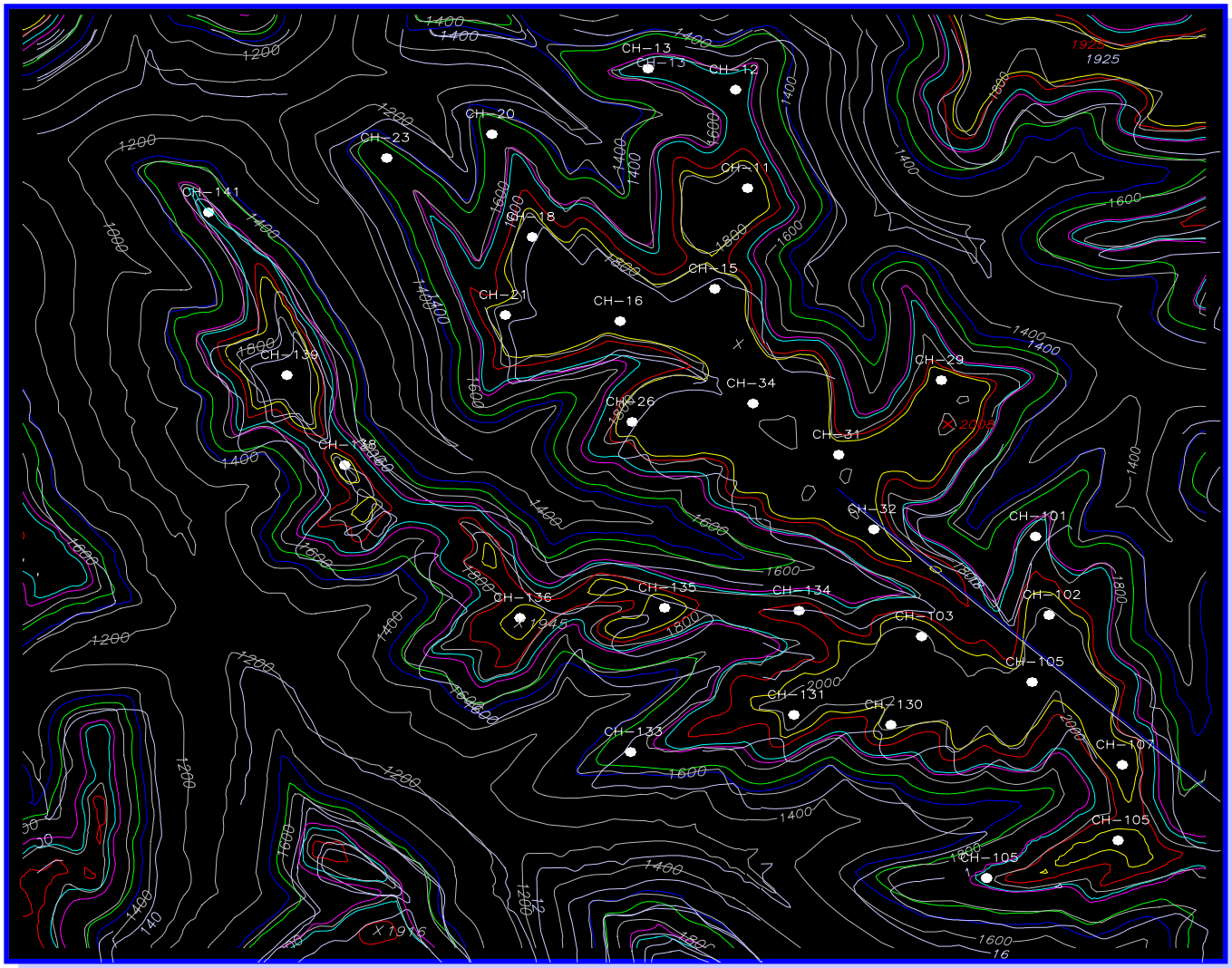
Topographic Map of Dragline Area



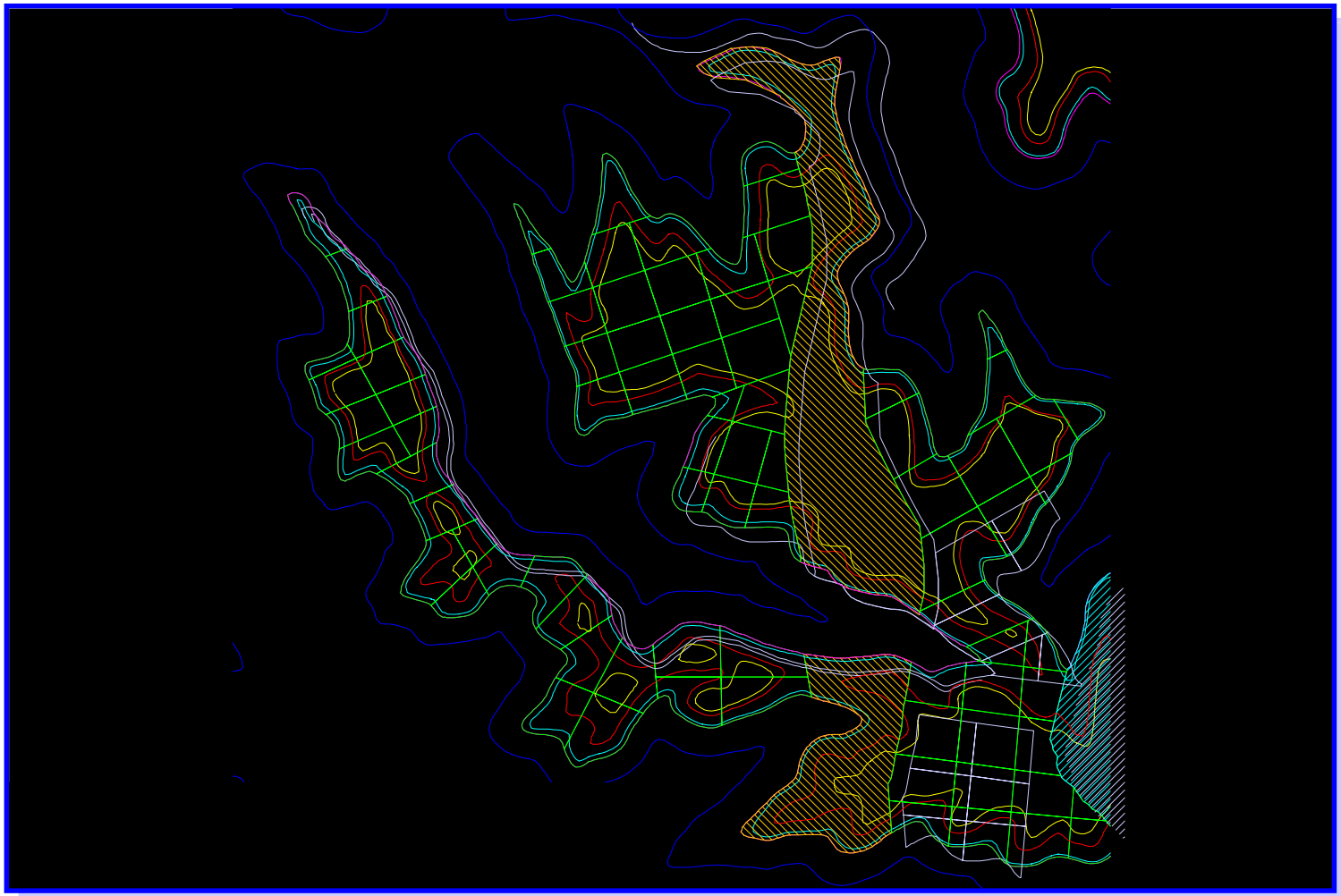
Coal Seam Correlation



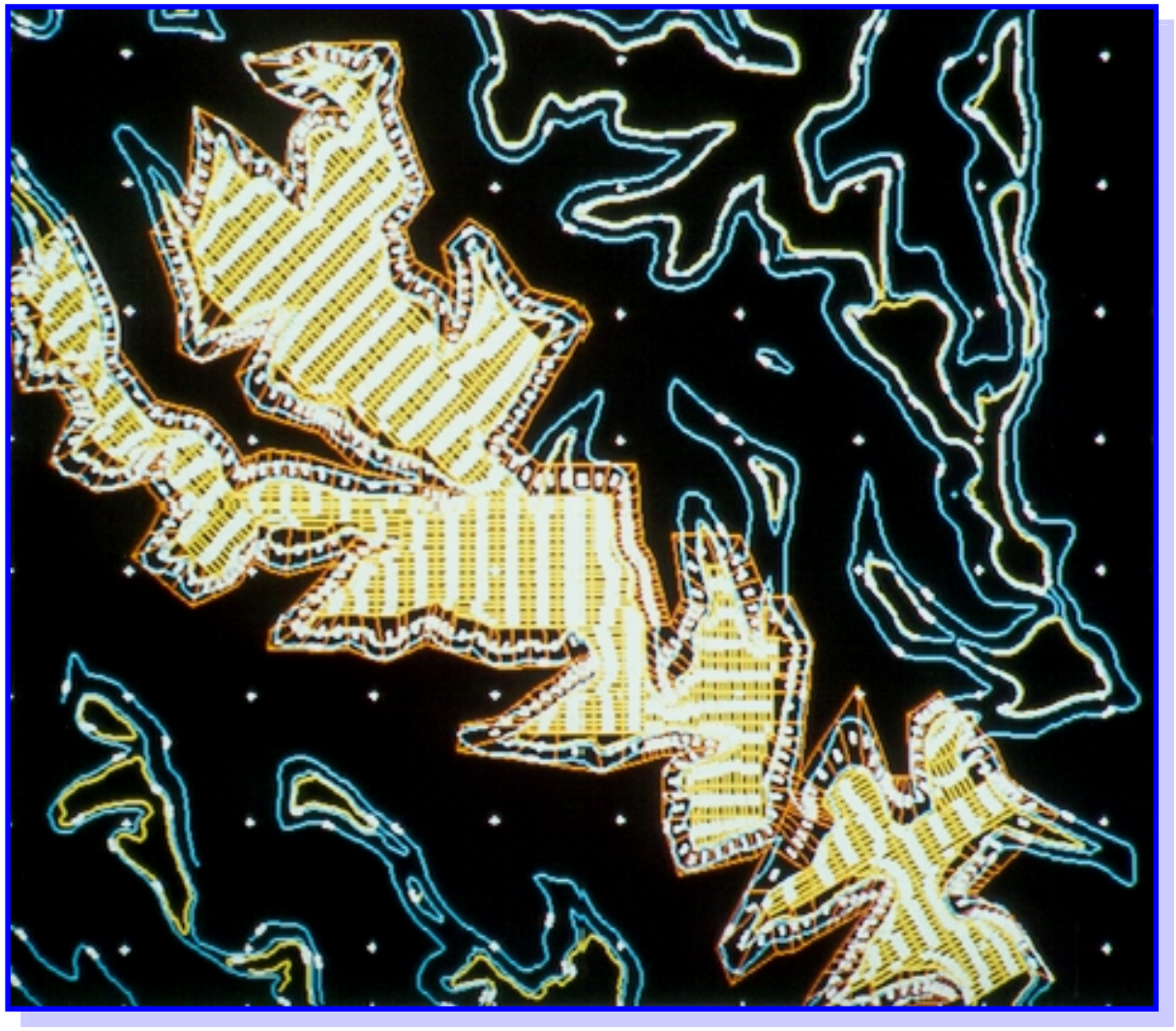
Coal Crops / Reserve Boundaries



Volumetric Gridding

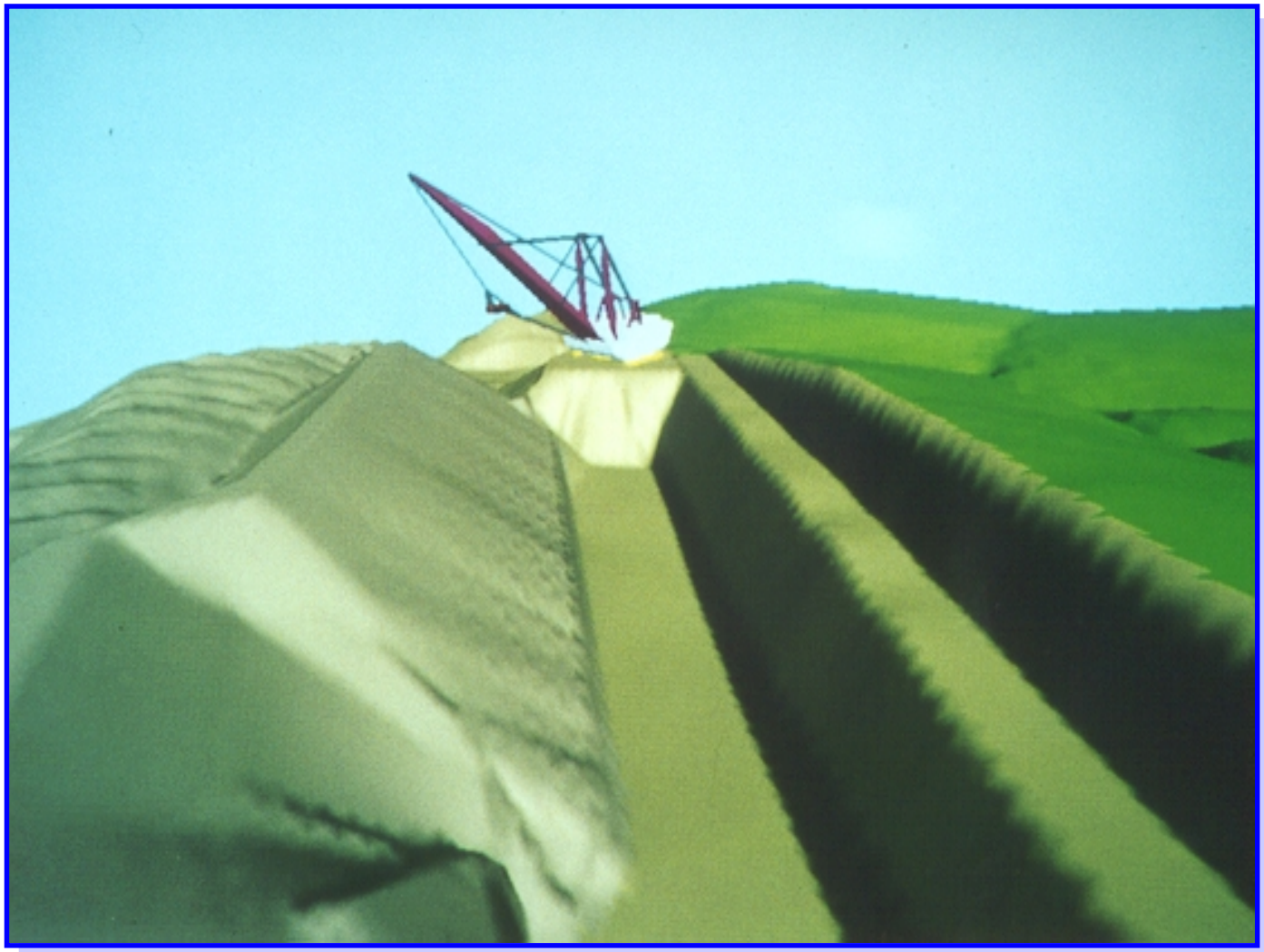


Mine Sequencing



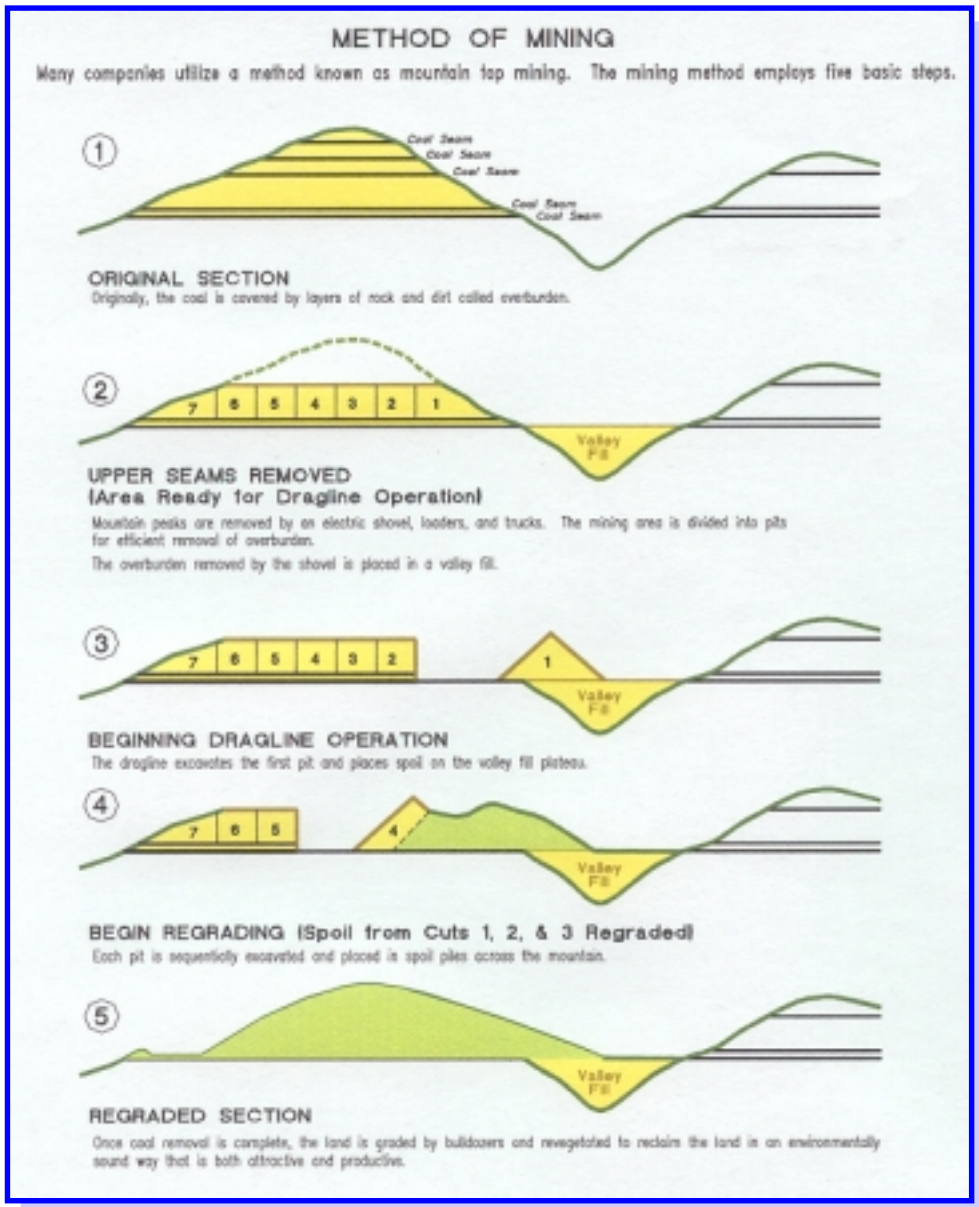
3-Dimensional Modeling

Pit Geometry

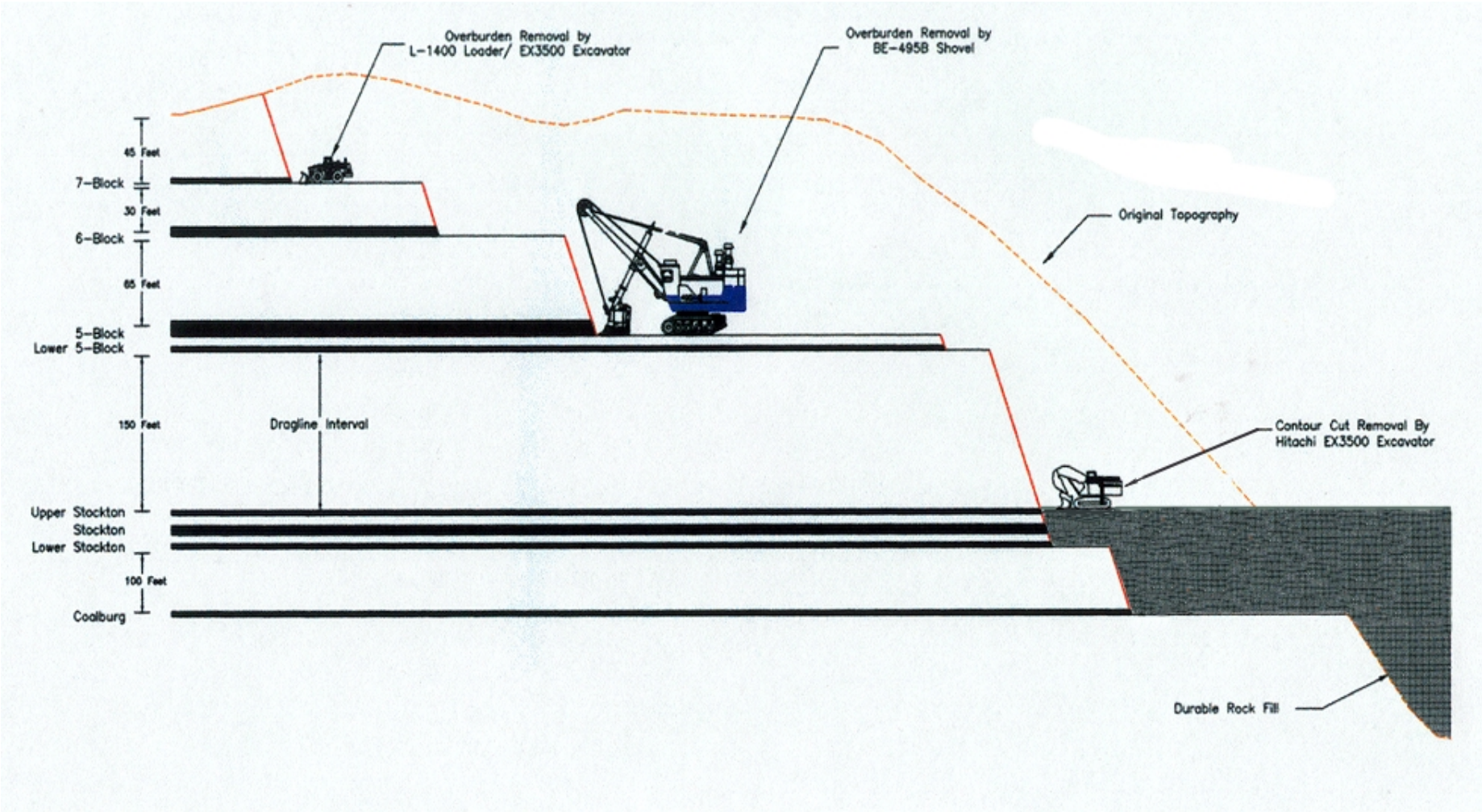


BE 2570 - Samples Mine

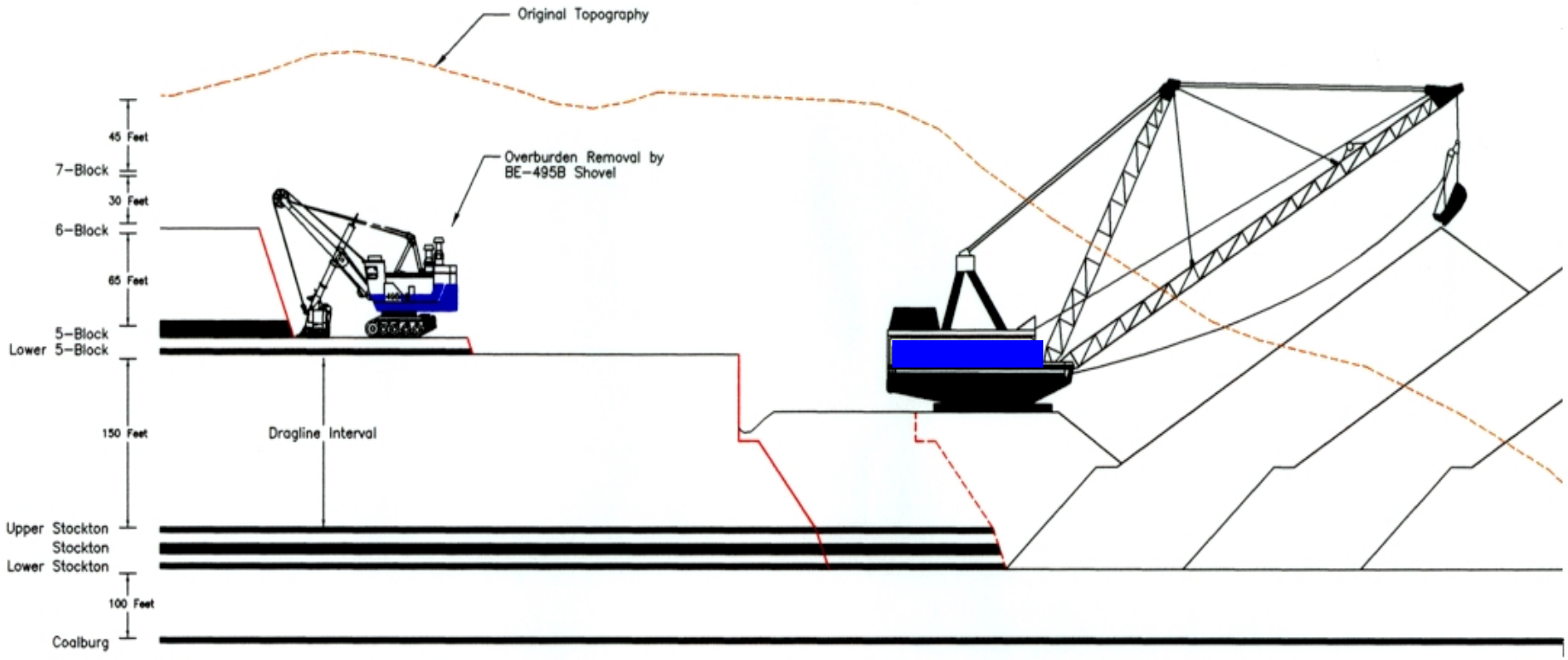
Schematic Showing Typical Dragline Operation



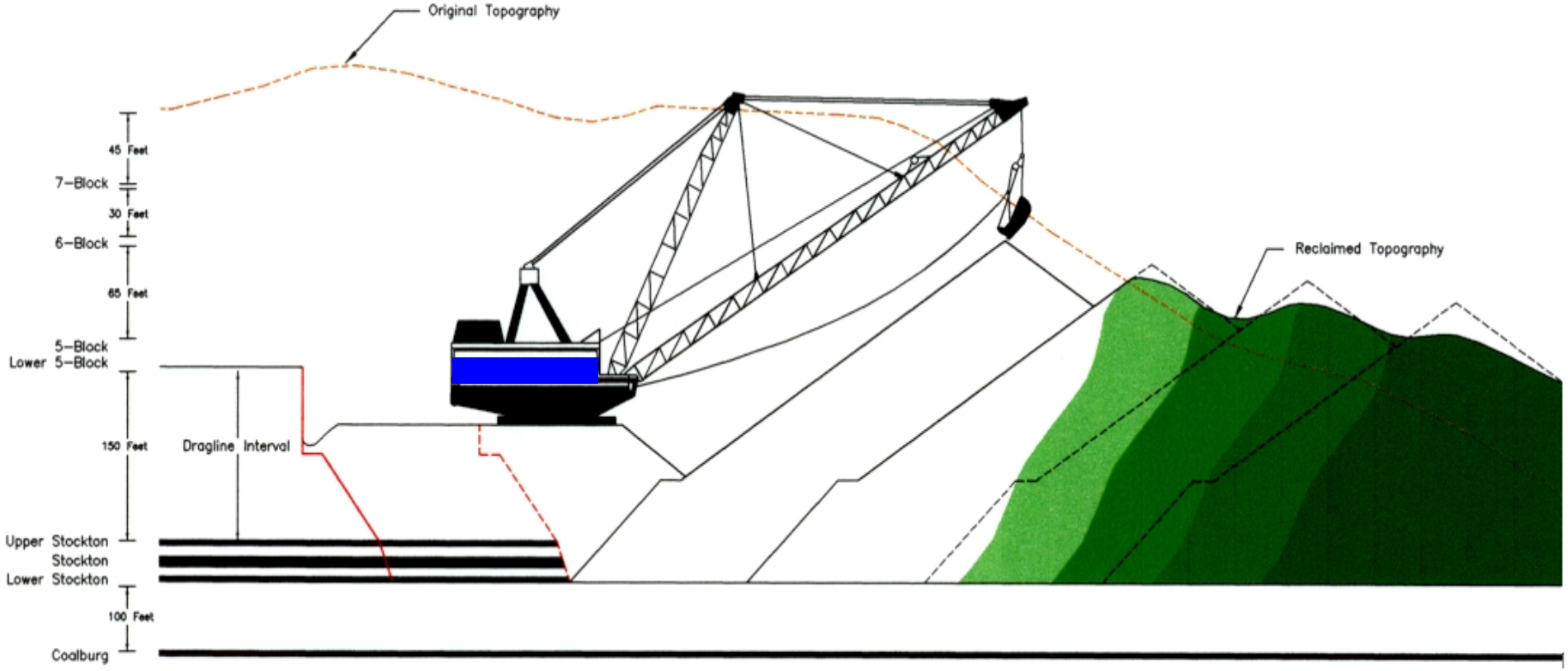
General Mining Sequence 'A'



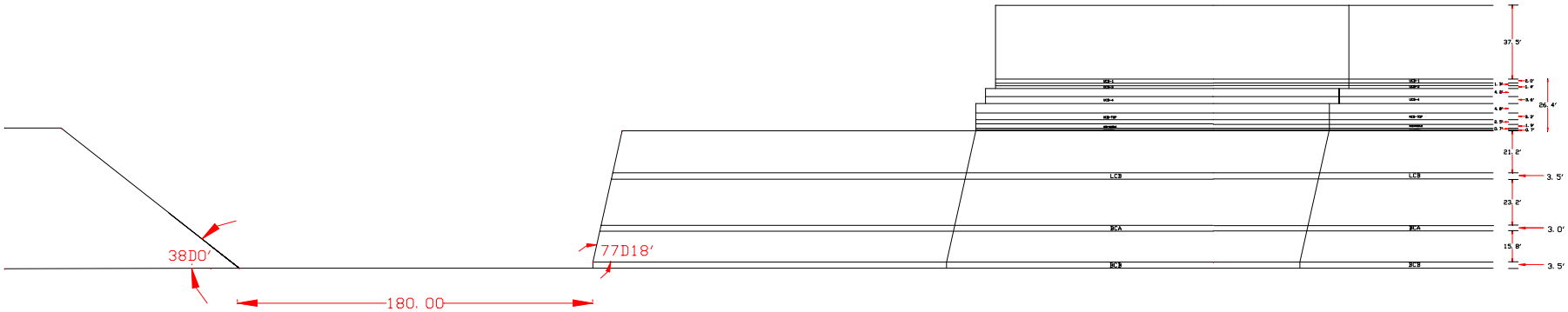
General Mining Sequence ‘B’



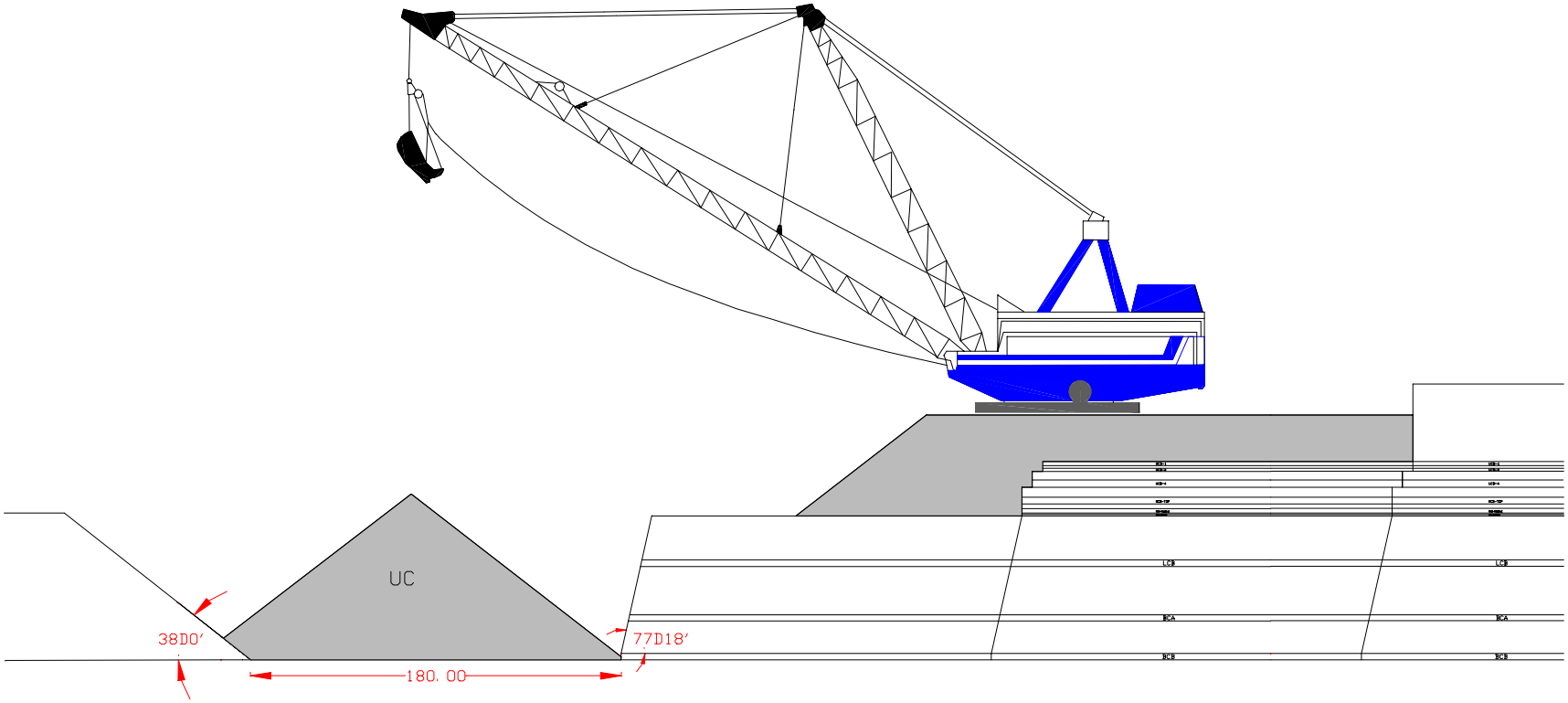
General Mining Sequence ‘C’



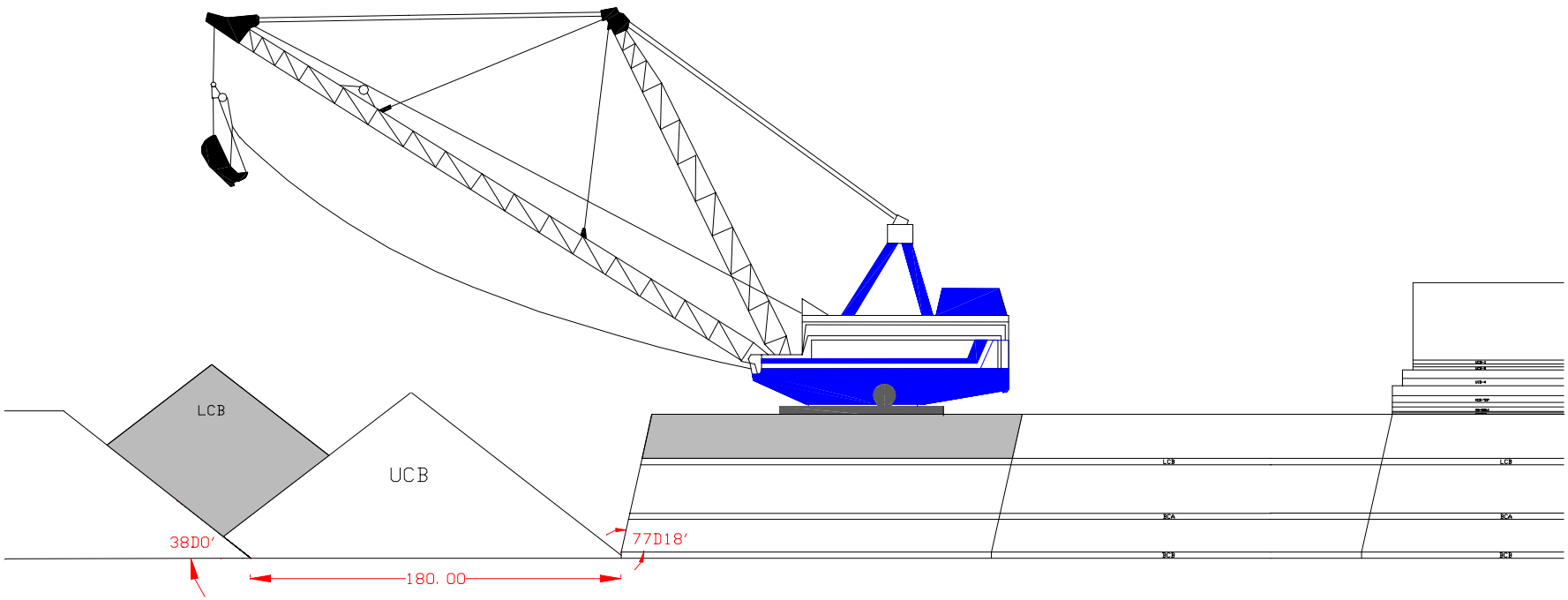
Typical Multi-Seam Dragline Sequence ‘1’



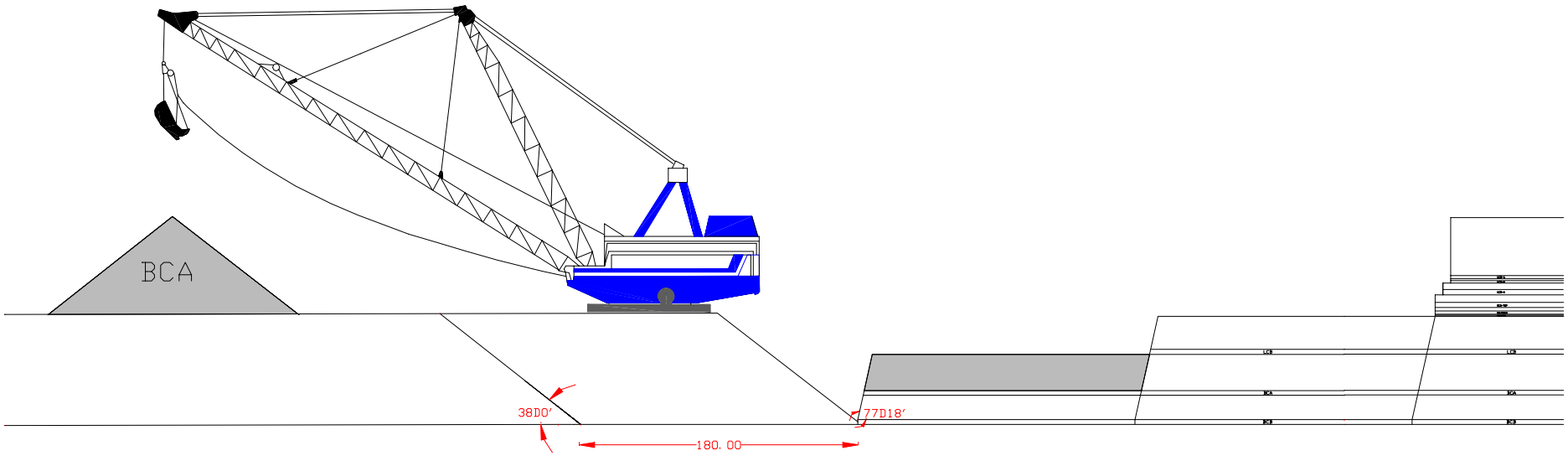
Typical Multi-Seam Dragline Sequence ‘2’



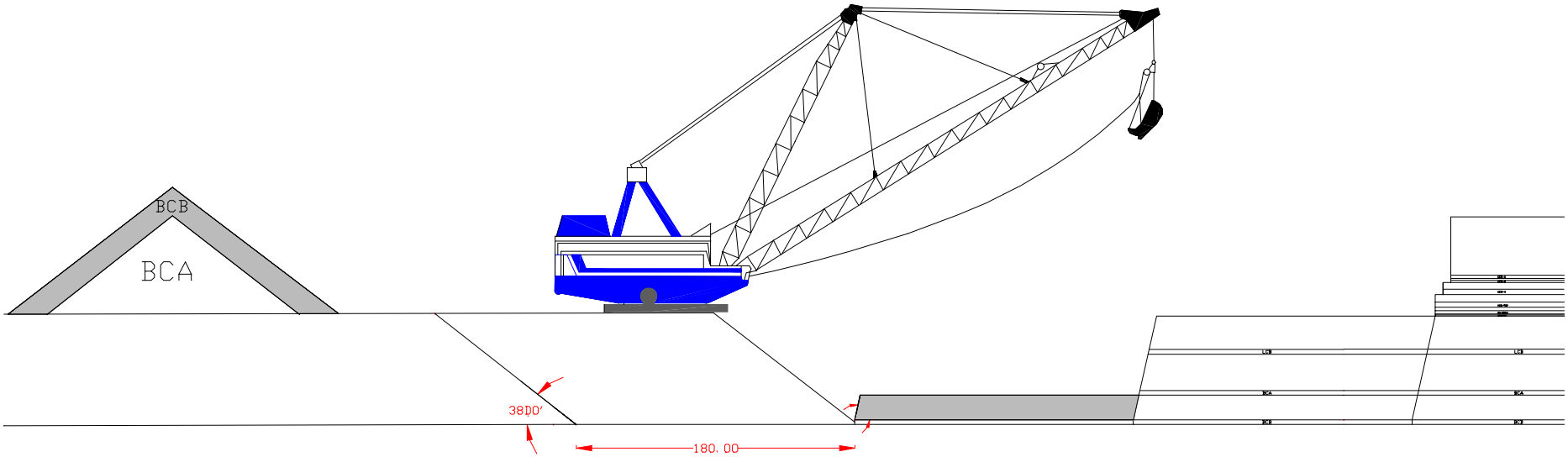
Typical Multi-Seam Dragline Sequence ‘3’



Typical Multi-Seam Dragline Sequence '4'



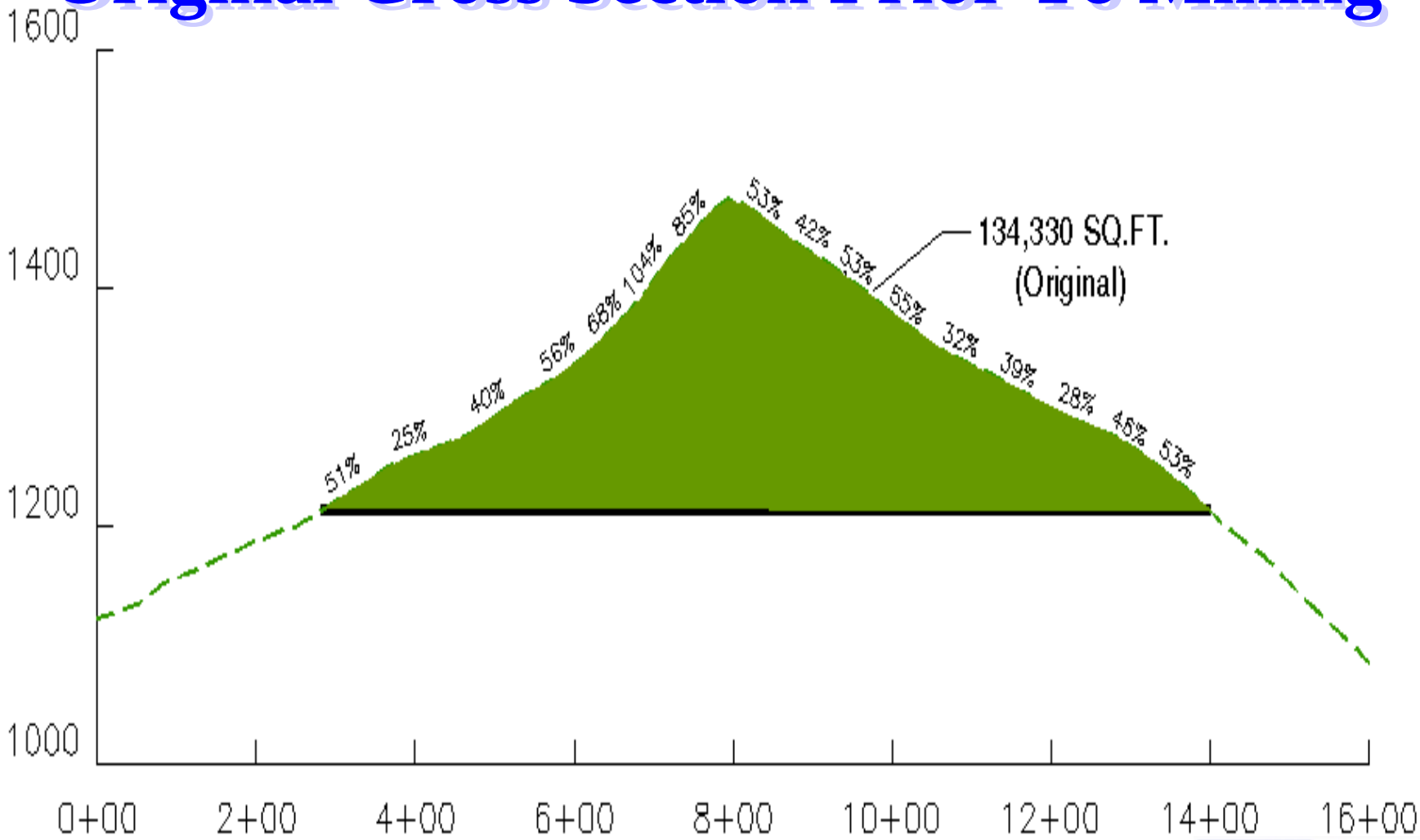
Typical Multi-Seam Dragline Sequence ‘5’



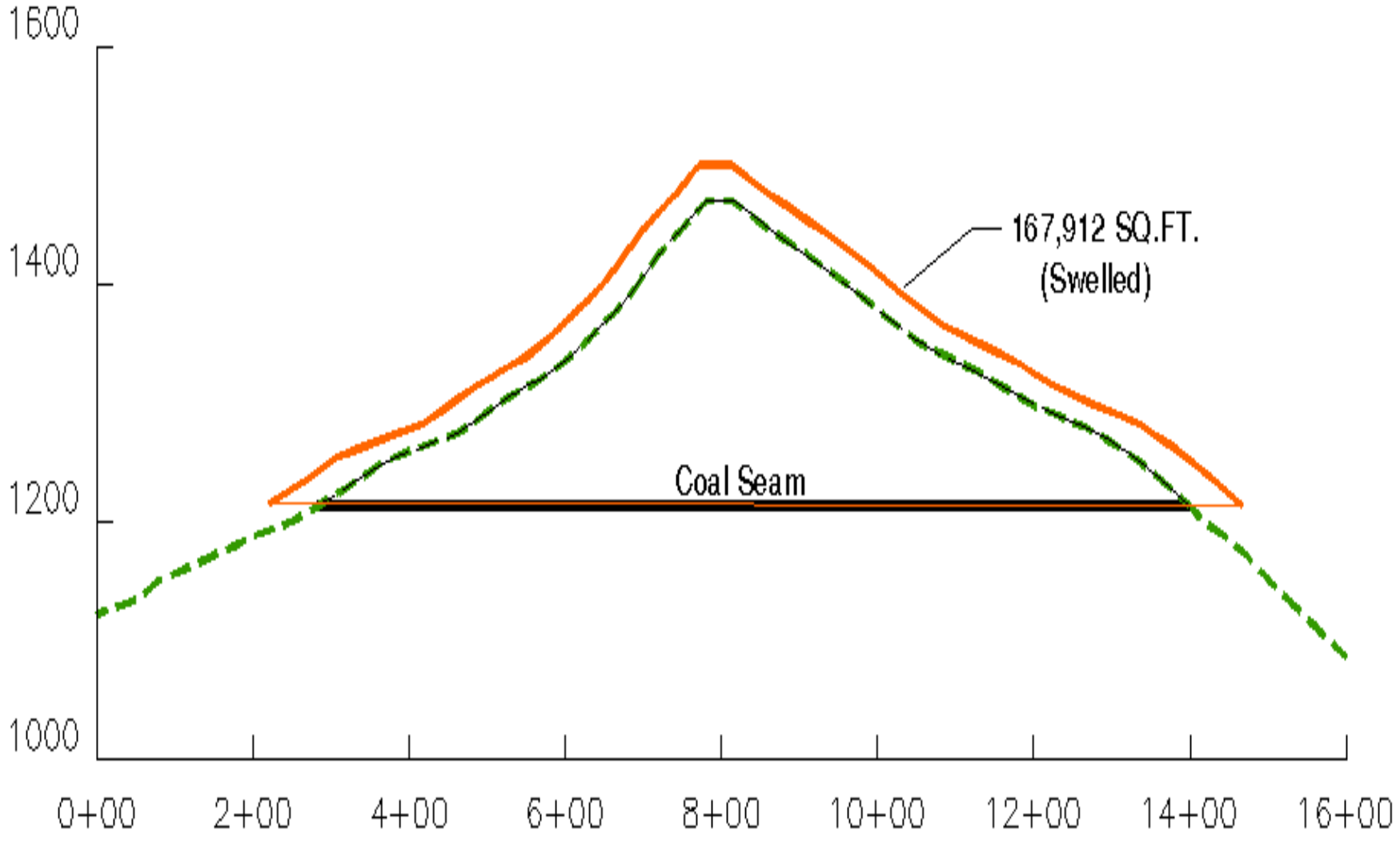
During Mining

After Mining
(1+ yrs. reclamation)

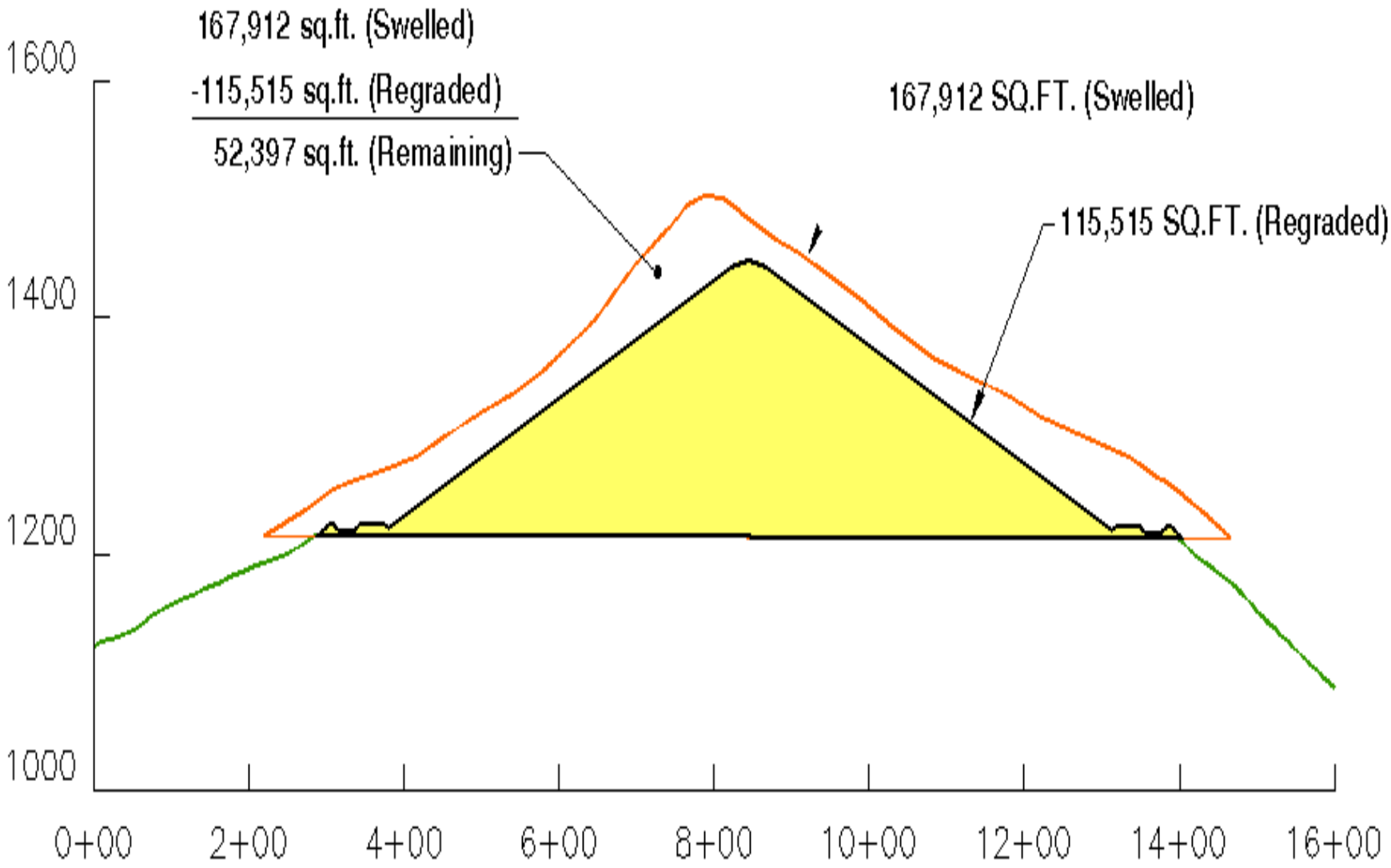
Concept of Excess Spoil
Original Cross Section Prior To Mining



Original Material Swelled 125%



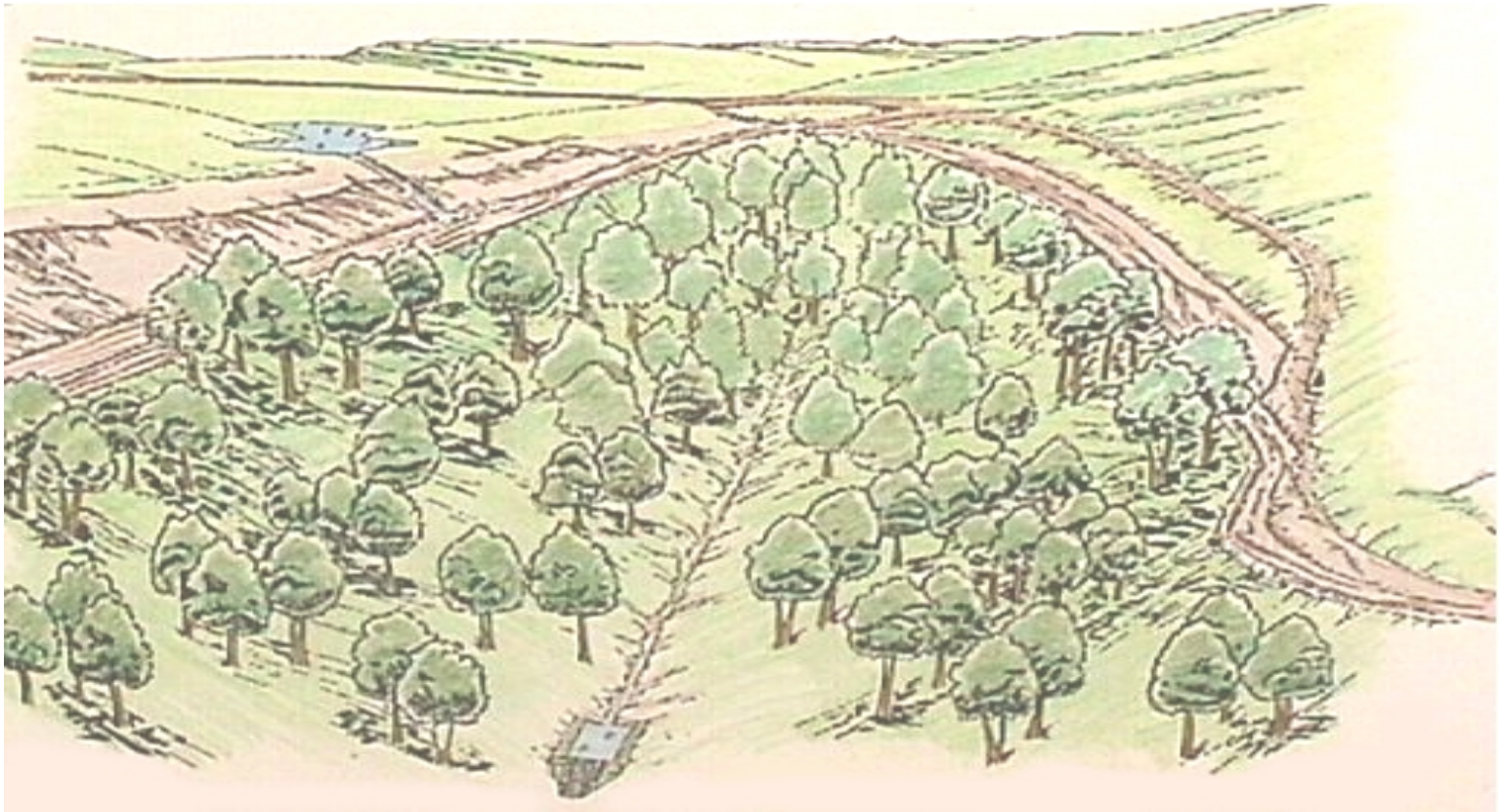
Regraded Cross Section After Reclamation



Concept of Excess Spoil Disposal Alternatives

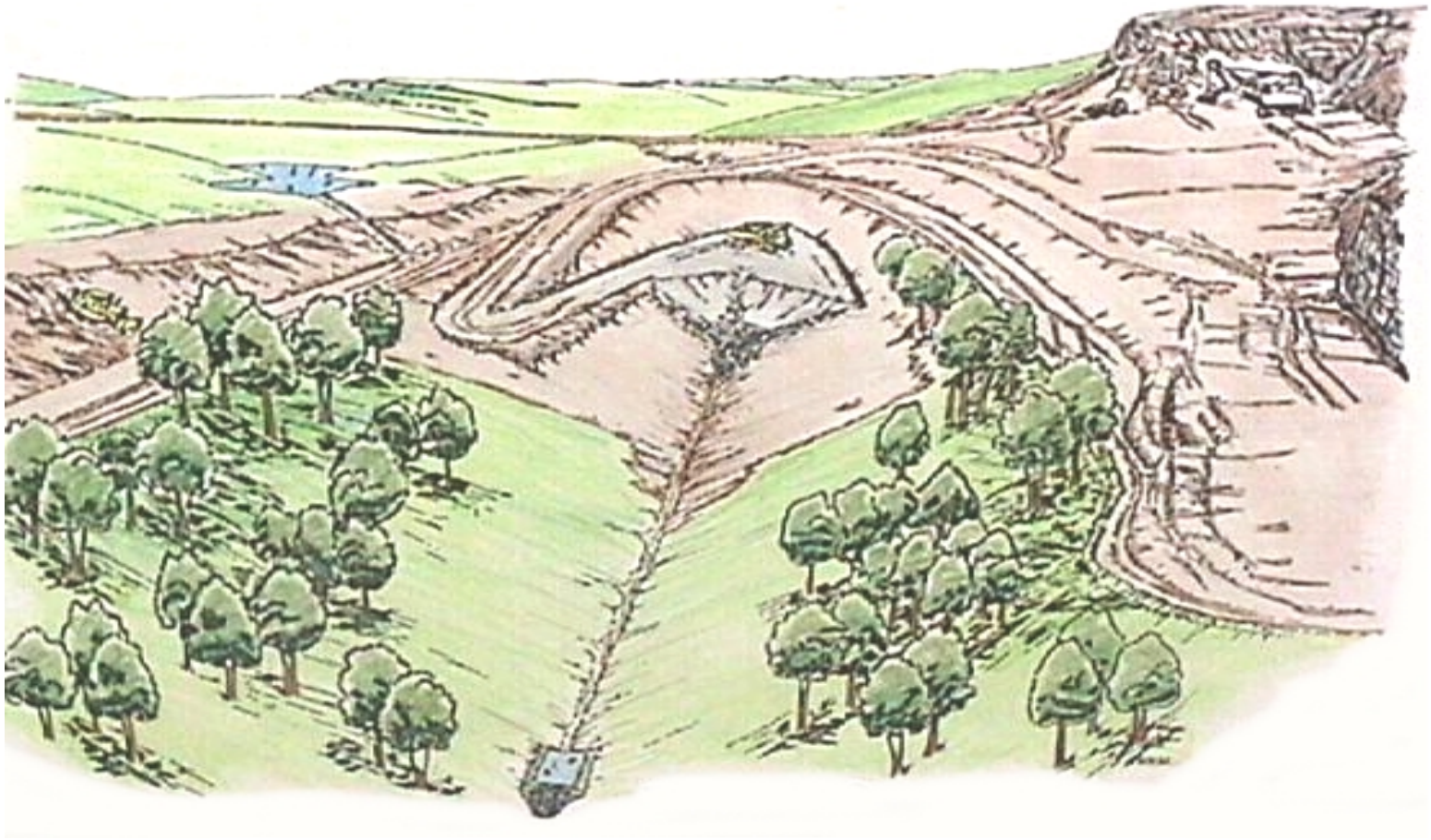
- ✔ Two primary disposal alternatives:
  1 - Valley Fill (usually durable rock construction)
  2 - Backfill on mined-out area

Durable Rock Valley Fill Construction



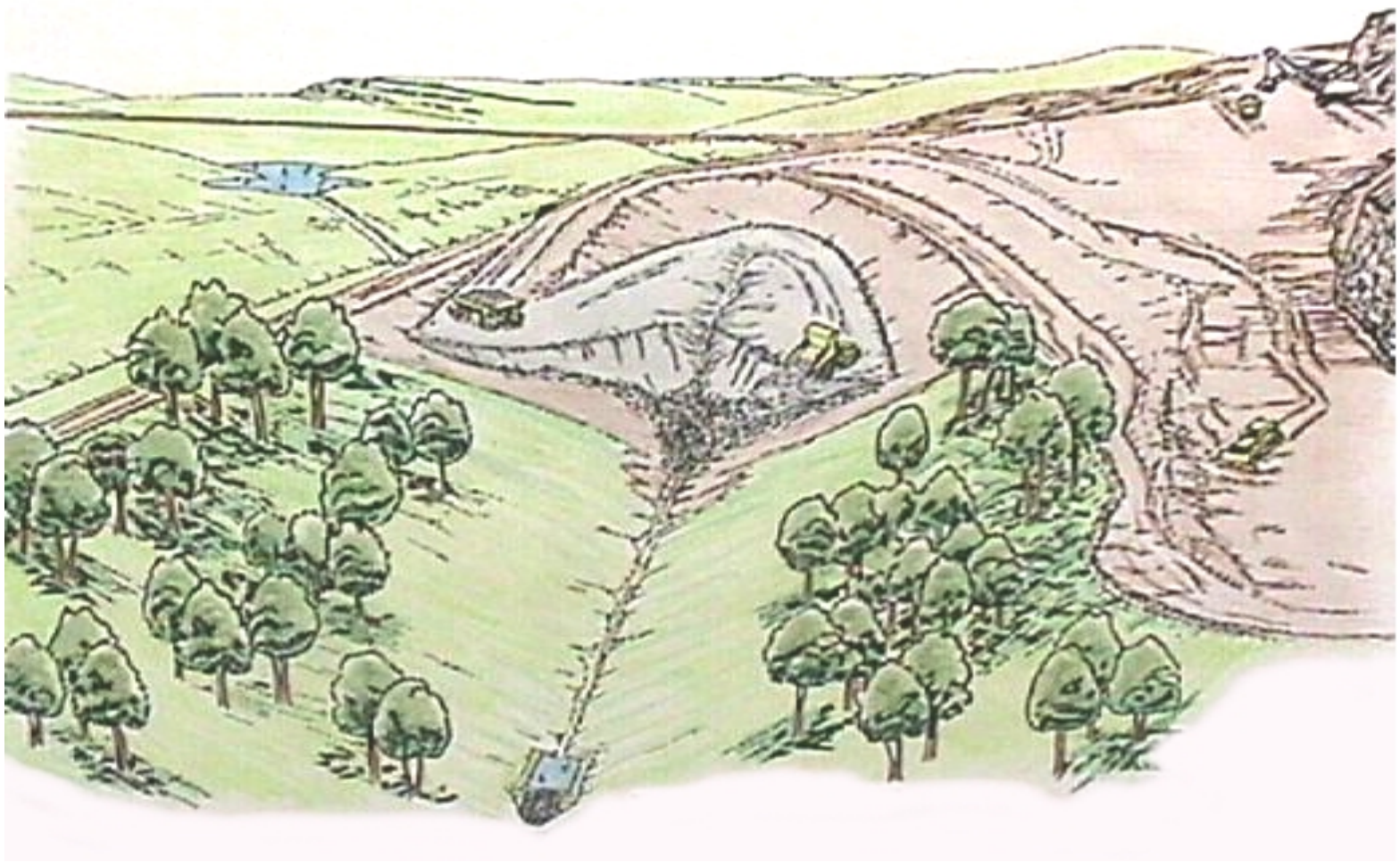
Phase 1

Sediment Pond Construction



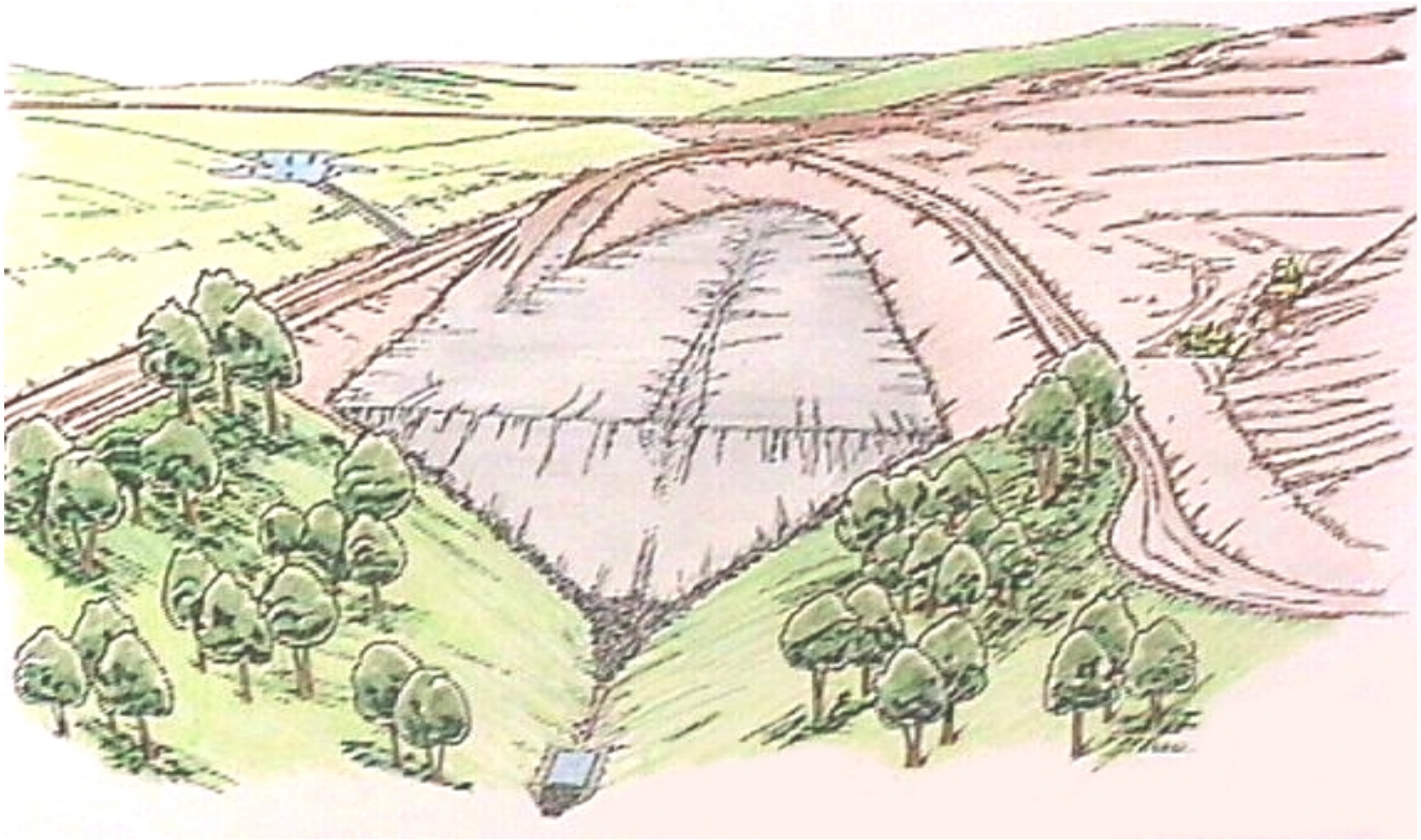
Phase 2

Initial Overburden Placement



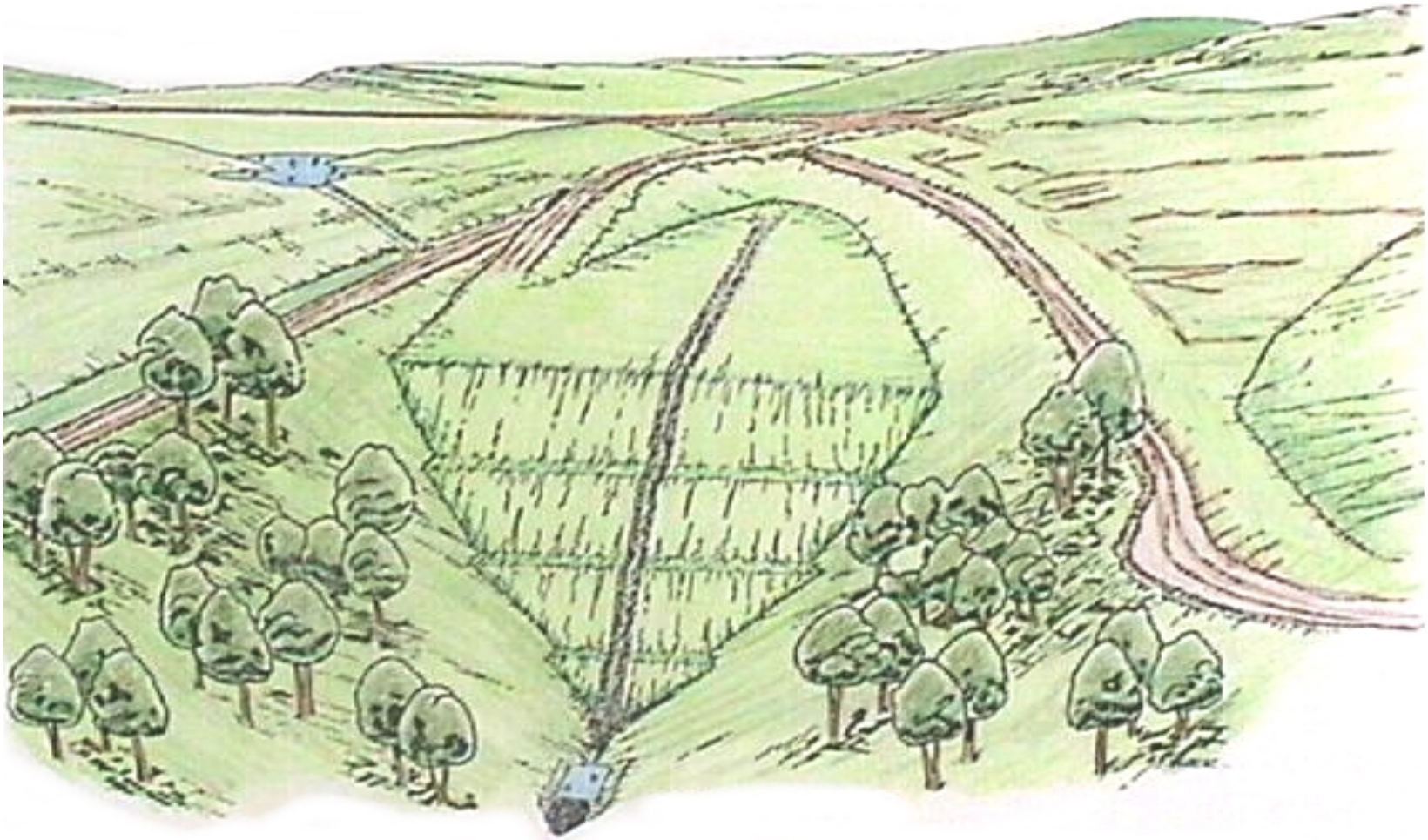
Phase 3

Continued Overburden Placement



Phase 4

Overburden Placement Completed
Surface Drainage Conveyances Constructed



Phase 5

Regrading / Revegetation Completed

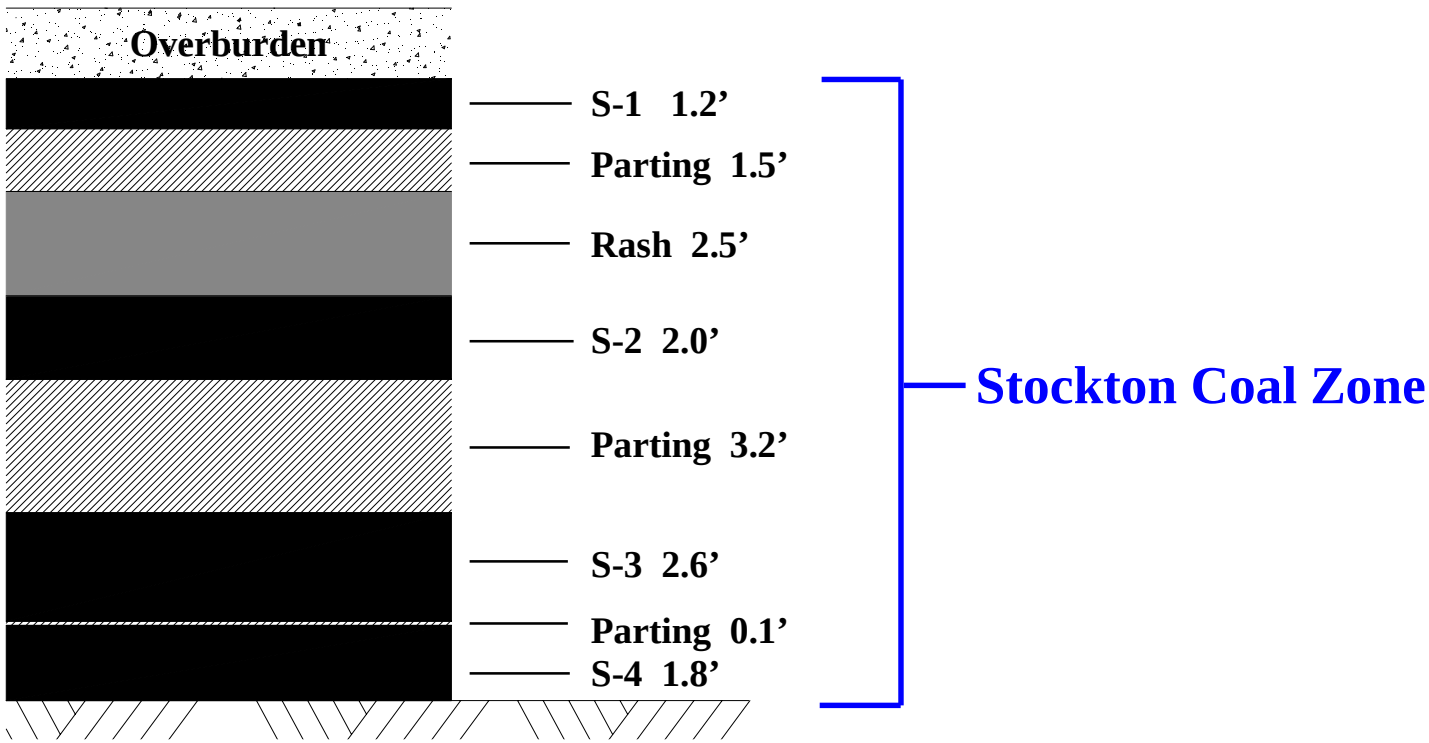

'98 5 27

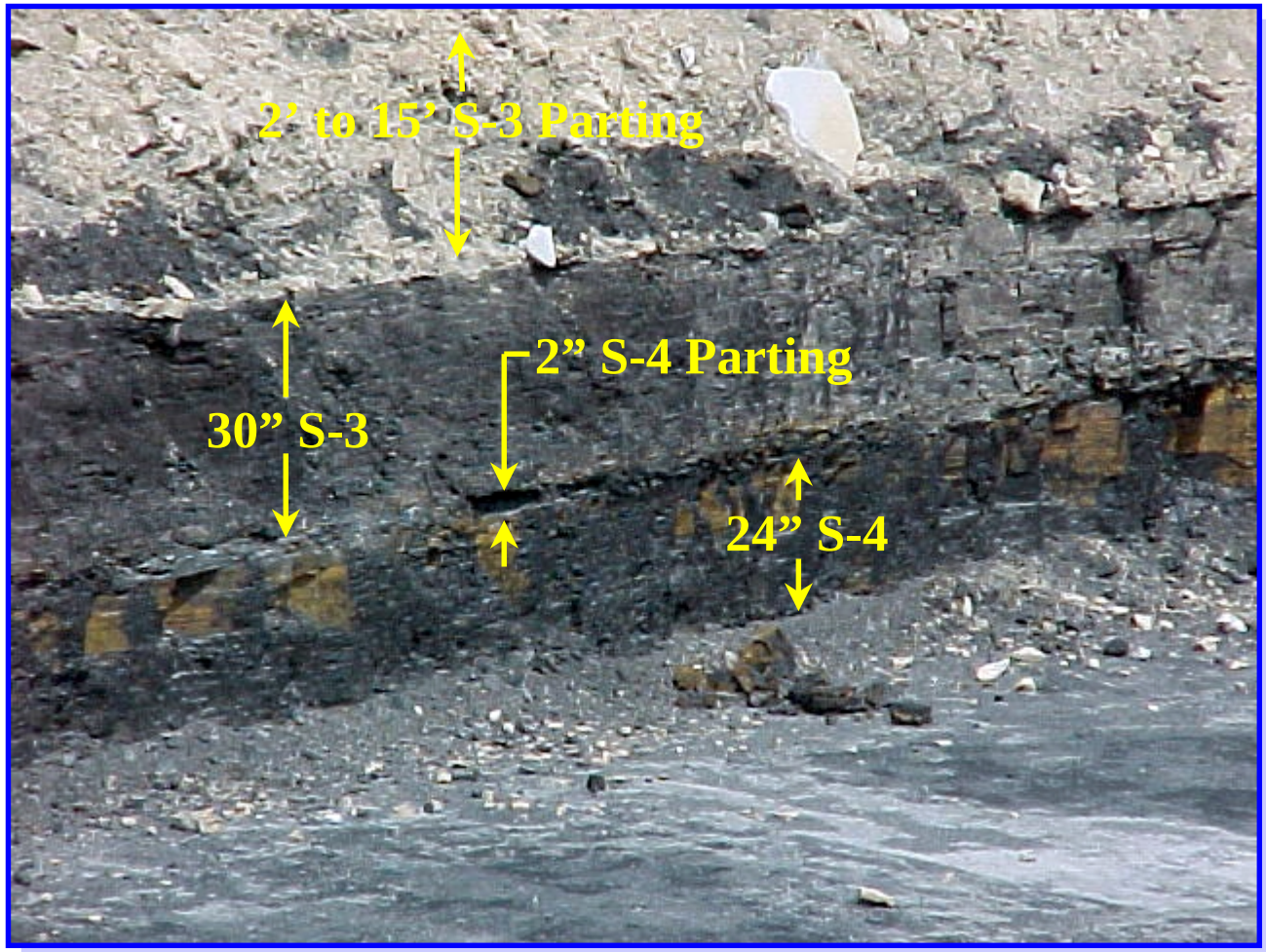
Backfilling Operations

Drilling & Blasting Operations

Coal Loading Operations

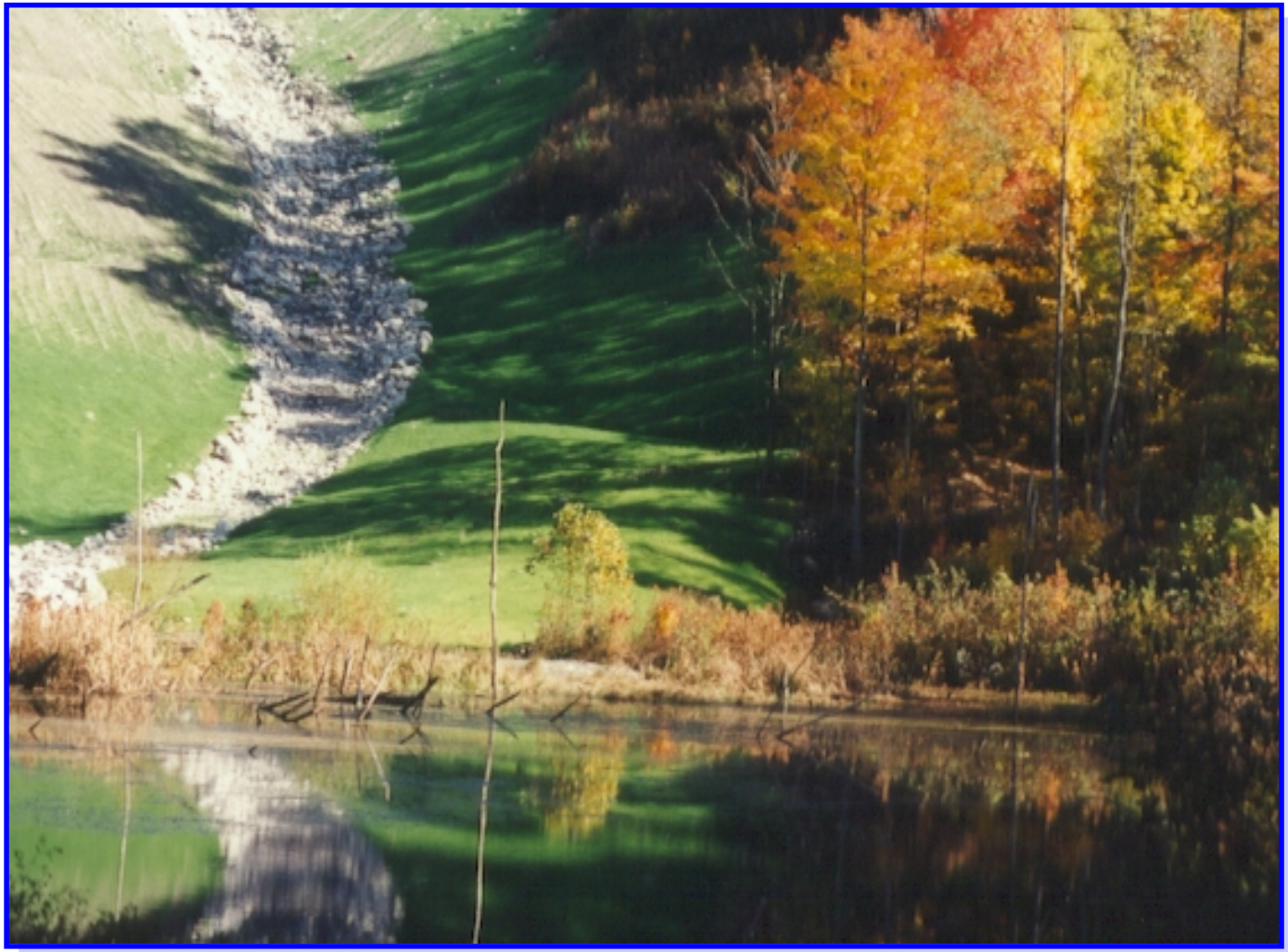
Typical Cross Section
Stockton Coal Zone




2’ to 15’ S-3 Parting
2” S-4 Parting
30” S-3
24” S-4

Environmental Considerations

Establishment of Drainage and Sedimentation Controls



Approximate Original Contour

Other...

✔Waste Management Plan

Ground Water Protection Plan

Spill Prevention Control &

Countermeasure Plan

Fixing the Scars of the Past

- "Third Generation" Surface Mining

  ✔ Restoration of abandoned refuse sites eligible for AML funding at no cost to the state

  ✔ Creation of wetlands and passive water treatment sites

  ✔ Elimination of miles of pre-SMCRA highwalls

  ✔ Extinguishment or isolation of abandoned underground mine fires

Pre-SMCRA Highwalls and Deep Mine Entries

Abandoned Coal Refuse Dumps

Acid Mine Drainage

Reclaimed Pre-law Refuse Sites

Wetlands Construction

Related Benefits

- ✔ Resource recovery
- ✔ Can address prior environmental problems
- ✔ Provides opportunities for future use of resource due to infrastructure development

Russian Dragline - Circa 1998