

Homestake - Work Breakdown Structure (WBS)

DRAFT - 28-Sep-2005 (Work-in-progress)

NOTES

1. WBS Levels 1 and 2, with emphasis on the highlighted sections where the majority of project effort is anticipated during the next year or two.

The structure aims to demonstrate an integrated approach for the project, with appropriate distribution of responsibilities among the collaborators (TBD).

It is generally a "product-oriented" work plan defined in terms of work-products and deliverables, for which resources, budgets and schedules can be identified and monitored.

The WBS generally follows the project timeline, however, we recognize that there will be significant amount of parallel effort and project phasing for the Mining-to-Labs Conversion, Re-entry and Early Access, Initial Suite of Science Experiments, Pre-Operations, Deep Labs development, etc.

2. WBS Level 3

WBS 1.1 is a preliminary outline for the project plan and Conceptual Design Package.

WBS 1.2 Aims to develop a complete System Requirements Document and database which serves as the basis for continuing design effort, design validation, and performance verification.

WBS 1.3 describes the overall facility design and subsystem interfaces to establish an integrated approach for delegation of subsystem responsibilities and monitoring progress, budgets, resource allocation, and schedules.

WBS 1.4 and 1.5 include design effort and deliverables for all subsystems.

WBS 1.6 covers the "implementation" phases of construction, installation, commissioning, etc.

WBS 1.7 and 1.8 define the project and subprojects end points and completion criteria.

3. WBS Levels 1-7 (Work in Progress)

Comments and recommendations are needed to determine an appropriate level of detail at the lower levels, particularly with input from all disciplines and "subject-matter-experts" to define the WBS work plans and work products.

WBS Levels							Homestake - Work Breakdown Structure (WBS)
1	2	3	4	5	6	7	
							<i>DRAFT - 29-Sep-2005 (Work-in-progress)</i>
WBS #							Description
1							Homestake 4850 Laboratory and Deep Underground Science and Engineering Laboratory Project
1	1						Homestake Development Plan and Conceptual Design Package
1	2						Homestake Facility and Science Laboratory Requirements
1	3						Homestake Facility and Labs Integrated System Design
1	4						Subsystems Design: Homestake Site Infrastructure, Conversion, and Re-entry
1	5						Subsystems Design: Homestake Science and Engineering Programs
1	6						Homestake Facility and Subsystems: Construction, Installation, Integration and Test
1	7						Homestake Facility: Validation and Commissioning
1	8						Homestake Project Close-Out
1	9						Homestake Pre-Operations

WBS Levels							Homestake - Work Breakdown Structure (WBS)
1	2	3	4	5	6	7	
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WBS #							Description
1							Homestake 4850 Laboratory and Deep Underground Science and Engineering Laboratory Project
1	1						Homestake Development Plan and Conceptual Design Package
1	1	1					Mission Need Statement
1	1	2					Work Breakdown Structure (WBS)
1	1	3					Preliminary Project Execution Plans and Design Concepts
1	1	4					Project Management Plans
1	1	5					Environment, Health and Safety Management Plans
1	1	6					Education and Public Outreach Plans
1	1	7					Risk Management Plan
1	1	8					Reliability and Quality Assurance Plan
1	1	9					Research & Development Plans
1	1	A					Information and Records Management Plan
1	1	B					Project Management Support
1	1	C					Conceptual Design Package, Reports, and Reviews
1	2						Homestake Facility and Science Laboratory Requirements
1	2	1					Requirements by Source
1	2	2					Requirements by Type
1	2	3					Requirements Traceability Tree
1	2	4					System Requirements Document (SRD) & Database, and Reviews
1	3						Homestake Facility and Labs Integrated System Design
1	3	1					Development Tradeoff Study Report
1	3	2					Facility and Labs Subsystems
1	3	3					Facility and Labs Requirements by Subsystem - Database
1	3	4					Facility and Labs Subsystem-to-Subsystem Interface Requirements - Database
1	3	5					Facility and Labs Subsystems Construction, Inspection, and Validation Requirements - Database
1	3	6					Homestake Facility and Labs Integrated System Design Package, Reports, and Reviews
1	4						Subsystems Design: Homestake Site Infrastructure, Conversion, and Re-entry
1	4	1					Sub-Subsystem Design: Site Infrastructure and Conventional Facilities
1	4	2					Sub-Subsystem Design: Conversion, Re-entry and Access to 4850 and Above
1	4	3					Sub-Subsystem Design: Conversion, Re-entry and Access to Deep Labs Below 4850
1	5						Subsystems Design: Homestake Science and Engineering Programs
1	5	1					Science and Engineering Programs: Management and Coordination
1	5	2					Science and Engineering Programs: Labs and Infrastructure Design
1	6						Homestake Facility and Subsystems: Construction, Installation, Integration and Test
1	6	1					(Project and Subprojects Implementation - Add Detailed Scope)
1	7						Homestake Facility: Validation and Commissioning
1	7	1					(Project and Subprojects Validation and Commissioning - Add Detailed Scope)
1	8						Homestake Project Close-Out
1	8	1					Homestake Conversion and 4850 Re-Entry Project Close-out
1	8	2					Homestake 4850 Science and Engineering Labs Project Close-out (Initial Suite of Experiments)
1	8	3					Homestake Deep Labs Re-Entry Project Close-out
1	9						Homestake Pre-Operations
1	9	1					Facility Pre-Operations
1	9	2					Science Pre-Operations

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WBS #							Description
1							Homestake 4850 Laboratory and Deep Underground Science and Engineering Laboratory Project
1	1						Homestake Development Plan and Conceptual Design Package
1	1	1					Mission Need Statement
1	1	1	1				Science and Engineering Programs and Objectives
1	1	1	2				Early Access and Initial Suite of Experiments
1	1	1	3				4850 Lab Capabilities
1	1	1	4				Deep Lab Capabilities
1	1	1	5				Long-Term Programs and Development Potential
1	1	2					Work Breakdown Structure (WBS)
1	1	2	1				Integrated Project WBS
1	1	2	2				Precedence Chart (for Schedule Planning)
1	1	3					Preliminary Project Execution Plans and Design Concepts
1	1	3	1				Project Functions and Responsibilities
1	1	3	1				Organizational Responsibilities
1	1	3	1				Staffing Plans
1	1	3	1				Work Authorization Plans
1	1	3	1				Reporting Plans
1	1	3	2				Mining-to-Labs Conversion Project Plan and Acquisition Strategy
1	1	3	2	1			Site Characterization and Assessment Plan
1	1	3	2	1	1		Land Survey
1	1	3	2	1	2		Geological Characterization
1	1	3	2	1	3		Rock and Excavation Stability Assessment
1	1	3	2	1	4		Hydrological Characterization
1	1	3	2	1	5		Environmental Assessment and Environmental Impact Studies
1	1	3	2	1	6		Accessibility, Logistics, and Transportation Assessment
1	1	3	2	1	7		Site CAD Models
1	1	3	2	2			Land Acquisition and Easements Management Plan
1	1	3	2	2	1		Surface Land Ownership and Access Rights
1	1	3	2	2	2		Underground Ownership and Access Rights
1	1	3	2	2	3		Road Easements
1	1	3	2	2	4		Utility Easements
1	1	3	2	2	5		Public and Private Roads and Fees
1	1	3	2	2	6		Indemnification
1	1	3	2	2	7		Insurance
1	1	3	2	2	8		Permitting Requirements for Construction and Operations
1	1	3	2	2	8	1	Excavation Rock Disposal
1	1	3	2	2	8	2	Water Discharge
1	1	3	2	2	8	3	Inspections and Oversight Responsibilities
1	1	3	2	3			Site Work Plan: Infrastructure and Conventional Facilities Restoration and Improvements
1	1	3	2	3	1		Roads Improvements and Maintenance
1	1	3	2	3	2		Landscaping and Clearing
1	1	3	2	3	3		Earthwork
1	1	3	2	3	4		Foundations
1	1	3	3				Project Execution Plan for Re-entry and Access to 4850
1	1	3	3	1			(Add detailed scope)
1	1	3	4				Project Execution Plan for Re-entry and Access to Deep Labs Below 4850
1	1	3	4	1			(Add detailed scope)
1	1	3	5				Project Execution Plan for Science and Engineering Programs
1	1	3	5	1			Programs and Experiments Advisory Boards
1	1	3	5	2			Workshops, Collaborations, and Science Team Coordination
1	1	3	5	3			LOI's and Proposals
1	1	3	5	4			Exploring and Promoting International Collaborations
1	1	3	5	5			Initial Suite of Experiments: Selection Process and Design
1	1	3	5	6			Long-Term and Deep Lab Development Plan
1	1	3	5	7			Publications and Papers
1	1	3	5	8			Web Sites
1	1	3	6				Maintenance and Operations Plans
1	1	3	6	1			Site Infrastructure and Conventional Facilities
1	1	3	6	2			Science and Engineering Experimental Facilities
1	1	4					Project Management Plans
1	1	4	1				Project Management Plan for Conversion, Re-Entry and Access to 4850 (Phase I)

WBS Levels							Homestake - Work Breakdown Structure (WBS)
1	2	3	4	5	6	7	DRAFT - 29-Sep-2005 (Work-in-progress)
							(Add detailed scope)
1	1	4	2				Project Management Plan for 4850 Science and Engineering Programs (Phase II)
							(Add detailed scope)
1	1	4	3				Project Management Plan for Re-entry and Access to Deep Labs Below 4850 (Phase III)
							(Add detailed scope)
1	1	4	4				Project Management Plan for Deep Labs Science and Engineering Programs (Phase IV)
							(Add detailed scope)
1	1	4	5				Procurement Plan: Subcontracts, Consultants, Services, and Major Procurements
1	1	4	7				Project Controls
1	1	4	7	1			Estimates
1	1	4	7	1	1		Effort Estimates
1	1	4	7	1	2		Cost Estimates
1	1	4	7	1	3		Duration Estimates
1	1	4	7	2			Resources and Budgets Management
1	1	4	7	1	1		Financial Budget Profiles
1	1	4	7	1	2		Personnel Budget Profiles
1	1	4	7	1	3		Other Budget Profiles
1	1	4	7	3			Schedules
1	1	4	7	4			Project Controls Reports and Presentations
1	1	4	7	5			Project Controls Software
1	1	5					Environment, Health and Safety Management Plans
1	1	5	1				EH&S Plan for Conversion, Re-entry and Access to 4850
1	1	5	2				EH&S Plan for Conversion, Re-entry and Access to Deep Labs Below 4850
1	1	5	3				EH&S Plan for Development and Operation of Initial Suite of Science and Engineering Experiments
1	1	5	4				EH&S Plan for Long-Term Development, Operations, and Later Experiments
1	1	5	5				EH&S Plan for Decontamination and Decommissioning
1	1	5	6				Integrated Safety Management Plan
1	1	6					Education and Public Outreach Plans
1	1	6	1				Public Affairs
1	1	6	2				Educational Programs at Schools and Colleges
1	1	6	3				Web Sites
1	1	6	4				Publications
1	1	6	5				Human Resources
1	1	6	6				Training
1	1	7					Risk Management Plan
1	1	7	1				Preliminary Risk Analyses: Construction and Operation
1	1	7	2				State-of-the-Art Technologies and Technology Development Issues
1	1	7	3				Potential Project Risks associated with past or future mining activities
1	1	7	4				Preliminary Hazard Analysis Report
1	1	8					Reliability and Quality Assurance Plan
1	1	9					Research & Development Plans
1	1	9	1				Instrumentation and Monitoring
1	1	9	2				Construction and Underground Technologies
1	1	A					Information and Records Management Plan
1	8	A	1				Document Management and Database
1	8	A	1				Configuration Management and Change Control
1	8	A	1				Project Team Websites: (Reports, Action Item System, Problem Reporting, Risk Registry, etc.)
1	1	B					Project Management Support
1	8	B	1				Project Administrative Support
1	8	B	2				Travel
1	8	B	3				Supplies and Expenses, Computers, Software
1	1	C					Conceptual Design Package, Reports, and Reviews
1	1	C	1				Interim Progress Reports
1	1	C	2				Conceptual Design Package and Final Report
1	1	C	3				Reviews, Meetings and Presentations
1	2						Homestake Facility and Science Laboratory Requirements
1	2	1					Requirements by Source
1	2	1	1				Sources for System and Subsystem Requirements (List)
1	2	1	1	1			Science and Engineering Experiment - Workshops, Collaborations and Science Teams (List)
1	2	1	1	2			South Dakota Science and Technology Authority (SDSTA)
1	2	1	1	3			Codes and Standards (List)
1	2	1	1	4			Funding Sources (NSF, DOE)
1	2	1	1	5			Subject Matter Experts

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1	2	3	4	5	6	7	DRAFT - 29-Sep-2005 (Work-in-progress)
1	2	1	1	6			LBNL Management
1	2	1	2				System Requirements
1	2	2					Requirements by Type
1	2	2	1				Systems Functional Requirements
1	2	2	2				Systems Performance Requirements
1	2	2	3				Systems "-ility" and Other Requirements
1	2	2	4				Interface Requirements
1	2	2	5				Resource Requirements
1	2	2	5	1			Budgetary Requirements
1	2	2	5	2			Personnel Requirements
1	2	2	5	3			Other Resource Requirements
1	2	2	6				Schedule Requirements
1	2	2	7				General Requirements for Construction, Inspection and Validation
1	2	3					Requirements Traceability Tree
1	2	4					System Requirements Document (SRD) & Database, and Reviews
1	2	4	1				Mining-to-Labs Conversion, Re-entry and Access Requirements
1	2	4	3				4850 Labs - Science and Engineering Lab Requirements
1	2	4	3				Deep Labs Science and Engineering Lab Requirements
1	3						Homestake Facility and Labs Integrated System Design
1	3	1					Development Tradeoff Study Report
1	3	1	1				Decision Criteria
1	3	1	2				Project Phasing and Development Options Descriptions
1	3	1	3				Evaluation Scheme and Decision Tools
1	3	1	4				Primary Scope and De-scope Options
1	3	2					Facility and Labs Subsystems
1	3	2	1				(List)
1	3	3					Facility and Labs Requirements by Subsystem - Database
1	3	4					Facility and Labs Subsystem-to-Subsystem Interface Requirements - Database
1	3	5					Facility and Labs Subsystems Construction, Inspection, and Validation Requirements - Database
1	3	6					Homestake Facility and Labs Integrated System Design Package, Reports, and Reviews
1	1	6	1				Interim Progress Reports
1	1	6	2				Design Package and Final Report
1	1	6	3				Reviews, Meetings and Presentations
1	4						Subsystems Design: Homestake Site Infrastructure, Conversion, and Re-entry
1	4	1					Sub-Subsystem Design: Site Infrastructure and Conventional Facilities
1	4	1	1				Technical Support
1	4	1	1	1			Homestake Project Management and A/E Coordination
1	4	1	1	1	1		Construction Permits and Inspection
1	4	1	1	1	2		Subcontract Management: Consultants, Services, and Major Procurements
1	4	1	1	2			AE/CM Project Management and Services
1	4	1	1	3			Site Management, Roads and Landscaping
1	4	1	1	4			Mine and Groundwater Management
1	4	1	1	5			Excavation Disposal Management
1	4	1	2				Science Programs: Facility Support Services
1	4	1	3				Utility Systems
1	4	1	3	1			Electrical Site Services
1	4	1	3	2			HVAC Site Services
1	4	1	3	3			Site Utility Systems
1	4	1	3	4			Waste Management Systems
1	4	1	3	5			Fire Protection Systems
1	4	1	3	6			Maintenance and General Purpose Equipment
1	4	1	3	7			Compressed Gases
1	4	1	3	8			Cryogenics
1	4	1	3	9			Chemical Storage
1	4	1	3	A			Radon-reduces air supply
1	4	1	4				Conventional Facilities Local Controls
1	4	1	4	1			Electrical Power and Communication Services
1	4	1	4	2			HVAC Services
1	4	1	4	3			Mechanical and Piping Services
1	4	1	4	4			Waste Systems
1	4	1	4	5			Preventive and Predictive Maintenance Systems
1	4	1	4	6			Emergency Response Facility Systems
1	4	1	4	7			Site Security Systems

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1	2	3	4	5	6	7	DRAFT - 29-Sep-2005 (Work-in-progress)
1	4	1	4	8			Energy Management and Control Systems
1	4	1	5				Buildings - Upgrades, Alterations, and Outfitting
1	4	1	5	1			Administration and Operations
1	4	1	5	2			Visitors Center, Auditorium, and Education Center
1	4	1	5	3			Science and Engineering Laboratories
1	4	1	5	4			Data Center
1	4	1	5	5			Technical Shops and Assembly Shop
1	4	1	5	6			Housing
1	4	1	5	7			Cafeteria
1	4	1	5	8			Shipping and Receiving
1	4	1	5	9			Storage and Warehouse
1	4	1	5	A			Garage and Transportation
1	4	1	5	B			Utility Buildings
1	4	1	6				Site Infrastructure and Conventional Facilities: Design Package, Reports, and Reviews
1	4	1	6	1			Interim Progress Reports
1	4	1	6	2			Design Package and Final Report
1	4	1	6	3			Reviews, Meetings and Presentations
1	4	2					Sub-Subsystem Design: Conversion, Re-entry and Access to 4850 and Above
1	4	2	1				Shafts, Hoists and Headframes: Restoration, Alterations and Improvements
1	4	2	1	1			Access Shaft Yates: Restoration, Alterations and Improvements
1	4	2	1	1	1		Equipment and Infrastructure
1	4	2	1	1	1	1	Hoist and Headframe
1	4	2	1	1	1	2	Primary Support and Lining
1	4	2	1	1	1	3	Waterproofing and drainage
1	4	2	1	1	1	4	Steel and Concrete structures
1	4	2	1	1	1	5	Shaft and Conveyance
1	4	2	1	1	2		Mechanical Systems
1	4	2	1	1	2	1	HVAC
1	4	2	1	1	2	2	Humidity Control
1	4	2	1	1	2	3	Fume Control
1	4	2	1	1	2	4	Air Piping
1	4	2	1	1	2	5	Process Water Piping
1	4	2	1	1	2	6	Special Systems Piping
1	4	2	1	1	3		Electrical Systems
1	4	2	1	1	3	1	Electrical Service
1	4	2	1	1	3	2	Lighting
1	4	2	1	1	3	3	Monitors and Alarms
1	4	2	1	1	3	4	Voice/Data Communications
1	4	2	1	1	4		Health and Safety Systems
1	4	2	1	1	4	1	Fire Protection Systems
1	4	2	1	1	4	2	Air Quality Monitoring and Alarms
1	4	2	1	1	4	3	EH&S Special Systems
1	4	2	1	2			Access Shaft Ross: Restoration, Alterations and Improvements
1	4	2	1	2	1		Equipment and Infrastructure
1	4	2	1	2	1	1	Hoist and Headframe
1	4	2	1	2	1	2	Primary Support and Lining
1	4	2	1	2	1	3	Waterproofing and drainage
1	4	2	1	2	1	4	Steel and Concrete structures
1	4	2	1	2	1	5	Shaft and Conveyance
1	4	2	1	2	2		Mechanical Systems
1	4	2	1	2	2	1	HVAC
1	4	2	1	2	2	2	Humidity Control
1	4	2	1	2	2	3	Fume Control
1	4	2	1	2	2	4	Air Piping
1	4	2	1	2	2	5	Process Water Piping
1	4	2	1	2	2	6	Special Systems Piping
1	4	2	1	2	3		Electrical Systems
1	4	2	1	2	3	1	Electrical Service
1	4	2	1	2	3	2	Lighting
1	4	2	1	2	3	3	Monitors and Alarms
1	4	2	1	2	3	4	Voice/Data Communications
1	4	2	1	2	4		Health and Safety Systems
1	4	2	1	2	4	1	Fire Protection Systems

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1	2	3	4	5	6	7	DRAFT - 29-Sep-2005 (Work-in-progress)
1	4	2	1	2	4	2	Air Quality Monitoring and Alarms
1	4	2	1	2	4	3	EH&S Special Systems
1	4	2	2				Ramp System: Restoration, Alterations and Improvements
1	4	2	2	1			Ramp Restoration, Alterations and Improvements
1	4	2	2	1	1		Equipment and Infrastructure
1	4	2	2	1	1	1	Hoist and Headframe
1	4	2	2	1	1	2	Primary Support and Lining
1	4	2	2	1	1	3	Waterproofing and drainage
1	4	2	2	1	1	4	Steel and Concrete structures
1	4	2	2	1	1	5	Shaft and Conveyance
1	4	2	2	1	2		Mechanical Systems
1	4	2	2	1	2	1	HVAC
1	4	2	2	1	2	2	Humidity Control
1	4	2	2	1	2	3	Fume Control
1	4	2	2	1	2	4	Air Piping
1	4	2	2	1	2	5	Process Water Piping
1	4	2	2	1	2	6	Special Systems Piping
1	4	2	2	1	3		Electrical Systems
1	4	2	2	1	3	1	Electrical Service
1	4	2	2	1	3	2	Lighting
1	4	2	2	1	3	3	Monitors and Alarms
1	4	2	2	1	3	4	Voice/Data Communications
1	4	2	2	1	4		Health and Safety Systems
1	4	2	2	1	4	1	Fire Protection Systems
1	4	2	2	1	4	2	Air Quality Monitoring and Alarms
1	4	2	2	1	4	3	EH&S Special Systems
1	4	2	3				Access Facility Maintenance
1	4	2	3	1			Rock Support
1	4	2	3	2			Pumping and Drainage
1	4	2	3	3			Mechanical Piping Maintenance
1	4	2	3	4			Electrical Maintenance
1	4	2	3	5			Communications Maintenance
1	4	2	3	6			Transportation
1	4	2	4				Life Safety and Health
1	4	2	4	1			Life Safety Systems
1	4	2	4	2			Fire Suppression
1	4	2	4	3			Rescue Equipment
1	4	2	4	4			Emergency Response and Communication
1	4	2	4	5			Safety and Emergency Training
1	4	2	5				Conversion, Re-entry and Access to 4850 and Above: Design Package, Reports, and Reviews
1	4	2	5	1			Interim Progress Reports
1	4	2	5	2			Design Package and Final Report
1	4	2	5	3			Reviews, Meetings and Presentations
1	4	3					Sub-Subsystem Design: Conversion, Re-entry and Access to Deep Labs Below 4850
1	4	3	1				Shafts, Hoists and Headframes: Restoration, Alterations and Improvements
1	4	3	1	1			Access Shaft 6 Winze
1	4	3	1	1	1		Equipment and Infrastructure
1	4	3	1	1	1	1	Hoist and Headframe
1	4	3	1	1	1	2	Primary Support and Lining
1	4	3	1	1	1	3	Waterproofing and drainage
1	4	3	1	1	1	4	Steel and Concrete structures
1	4	3	1	1	1	5	Shaft and Conveyance
1	4	3	1	1	2		Mechanical Systems
1	4	3	1	1	2	1	HVAC
1	4	3	1	1	2	2	Humidity Control
1	4	3	1	1	2	3	Fume Control
1	4	3	1	1	2	4	Air Piping
1	4	3	1	1	2	5	Process Water Piping
1	4	3	1	1	2	6	Special Systems Piping
1	4	3	1	1	3		Electrical Systems
1	4	3	1	1	3	1	Electrical Service
1	4	3	1	1	3	2	Lighting
1	4	3	1	1	3	3	Monitors and Alarms

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1	2	3	4	5	6	7	DRAFT - 29-Sep-2005 (Work-in-progress)
1	4	3	1	1	3	4	Voice/Data Communications
1	4	3	1	1	4		Health and Safety Systems
1	4	3	1	1	4	1	Fire Protection Systems
1	4	3	1	1	4	2	Air Quality Monitoring and Alarms
1	4	3	1	1	4	3	EH&S Special Systems
1	4	3	1	2			Access Shaft XXX Winze
1	4	3	1	2	1		Equipment and Infrastructure
1	4	3	1	2	1	1	Hoist and Headframe
1	4	3	1	2	1	2	Primary Support and Lining
1	4	3	1	2	1	3	Waterproofing and drainage
1	4	3	1	2	1	4	Steel and Concrete structures
1	4	3	1	2	1	5	Shaft and Conveyance
1	4	3	1	2	2		Mechanical Systems
1	4	3	1	2	2	1	HVAC
1	4	3	1	2	2	2	Humidity Control
1	4	3	1	2	2	3	Fume Control
1	4	3	1	2	2	4	Air Piping
1	4	3	1	2	2	5	Process Water Piping
1	4	3	1	2	2	6	Special Systems Piping
1	4	3	1	2	3		Electrical Systems
1	4	3	1	2	3	1	Electrical Service
1	4	3	1	2	3	2	Lighting
1	4	3	1	2	3	3	Monitors and Alarms
1	4	3	1	2	3	4	Voice/Data Communications
1	4	3	1	2	4		Health and Safety Systems
1	4	3	1	2	4	1	Fire Protection Systems
1	4	3	1	2	4	2	Air Quality Monitoring and Alarms
1	4	3	1	2	4	3	EH&S Special Systems
1	4	3	2				Ramp System: Restoration, Alterations and Improvements
1	4	3	2	1			Ramp Restoration, Alterations and Improvements
1	4	3	2	1	1		Equipment and Infrastructure
1	4	3	2	1	1	1	Hoist and Headframe
1	4	3	2	1	1	2	Primary Support and Lining
1	4	3	2	1	1	3	Waterproofing and drainage
1	4	3	2	1	1	4	Steel and Concrete structures
1	4	3	2	1	1	5	Shaft and Conveyance
1	4	3	2	1	2		Mechanical Systems
1	4	3	2	1	2	1	HVAC
1	4	3	2	1	2	2	Humidity Control
1	4	3	2	1	2	3	Fume Control
1	4	3	2	1	2	4	Air Piping
1	4	3	2	1	2	5	Process Water Piping
1	4	3	2	1	2	6	Special Systems Piping
1	4	3	2	1	3		Electrical Systems
1	4	3	2	1	3	1	Electrical Service
1	4	3	2	1	3	2	Lighting
1	4	3	2	1	3	3	Monitors and Alarms
1	4	3	2	1	3	4	Voice/Data Communications
1	4	3	2	1	4		Health and Safety Systems
1	4	3	2	1	4	1	Fire Protection Systems
1	4	3	2	1	4	2	Air Quality Monitoring and Alarms
1	4	3	2	1	4	3	EH&S Special Systems
1	4	3	3				Access Facility Maintenance
1	4	3	3	1			Rock Support
1	4	3	3	2			Pumping and Drainage
1	4	3	3	3			Mechanical Piping Maintenance
1	4	3	3	4			Electrical Maintenance
1	4	3	3	5			Communications Maintenance
1	4	3	3	6			Transportation
1	4	3	4				Life Safety and Health
1	4	3	4	1			Life Safety Systems
1	4	3	4	2			Fire Suppression
1	4	3	4	3			Rescue Equipment

WBS Levels							Homestake - Work Breakdown Structure (WBS)
1	2	3	4	5	6	7	
							<i>DRAFT - 29-Sep-2005 (Work-in-progress)</i>
1	4	3	4	4			Emergency Response and Communication
1	4	3	4	5			Safety and Emergency Training
1	4	3	5				Conversion, Re-entry and Access to Deep Labs: Design Package, Reports, and Reviews
1	4	3	5	1			Interim Progress Reports
1	4	3	5	2			Design Package and Final Report
1	4	3	5	3			Reviews, Meetings and Presentations
1	5						Subsystems Design: Homestake Science and Engineering Programs
1	5	1					Science and Engineering Programs: Management and Coordination
1	5	1	1				4850 Lab Science Programs
1	5	1	1	1			Instrumentation Requirements, Interfaces, and Configuration Management
1	5	1	1	2			Software and Data Communications Requirements, Interfaces, and Configuration Management
1	5	1	1	3			PI and Collaboration Meetings, Reviews, and Reports
1	5	1	2				Surface Science Programs
1	5	1	2	1			Instrumentation Requirements, Interfaces, and Configuration Management
1	5	1	2	2			Software and Data Communications Requirements, Interfaces, and Configuration Management
1	5	1	2	3			PI and Collaboration Meetings, Reviews, and Reports
1	5	1	3				Deep Lab Science Programs
1	5	1	3	1			Instrumentation Requirements, Interfaces, and Configuration Management
1	5	1	3	2			Software and Data Communications Requirements, Interfaces, and Configuration Management
1	5	1	3	3			PI and Collaboration Meetings, Reviews, and Reports
1	5	1	4				Science Programs Administrative Support
1	5	2					Science and Engineering Programs: Labs and Infrastructure Design
1	5	2	1				<i>Standard Experimental Lab Design and Support</i>
1	5	2	1	1			<i>Experimental Systems and Lab Infrastructure Requirements</i>
1	5	2	1	2			<i>Experimental Systems and Lab Infrastructure Interfaces</i>
1	5	2	1	3			<i>Experimental Equipment and Technical Systems Design</i>
1	5	2	1	1	1		<i>Experimental Equipment and Systems</i>
1	5	2	1	1	2		<i>Assemble and Test Work Area</i>
1	5	2	1	1	3		<i>Cleanroom</i>
1	5	2	1	1	4		<i>Data Acquisition Systems</i>
1	5	2	1	1	4		<i>Staging and Storage</i>
1	5	2	1	4			<i>Lab Infrastructure and Outfitting Design</i>
1	5	2	1	2	1		<i>Lab Space Restoration and Improvements</i>
1	5	2	1	2	1	1	<i>Primary Support and Lining</i>
1	5	2	1	2	1	2	<i>Steel and Concrete structures</i>
1	5	2	1	2	1	3	<i>Waterproofing and drainage</i>
1	5	2	1	2	1	4	<i>Surface Finishes</i>
1	5	2	1	2	1	5	<i>Floor Slabs</i>
1	5	2	1	3	2		<i>Mechanical Infrastructure</i>
1	5	2	1	3	2	1	<i>HVAC</i>
1	5	2	1	3	2	2	<i>Humidity Control</i>
1	5	2	1	3	2	3	<i>Fume Control</i>
1	5	2	1	3	2	4	<i>Air Piping</i>
1	5	2	1	3	2	5	<i>Process Water Piping</i>
1	5	2	1	3	2	6	<i>Special Systems Piping</i>
1	5	2	1	4	3		<i>Electrical Infrastructure</i>
1	5	2	1	4	3	1	<i>Electrical Service</i>
1	5	2	1	4	3	2	<i>Lighting</i>
1	5	2	1	4	3	3	<i>Monitors and Alarms</i>
1	5	2	1	4	3	4	<i>Voice/Data Communications</i>
1	5	2	1	5	4		<i>Health and Safety Systems</i>
1	5	2	1	5	4	1	<i>Fire Protection and Alarms</i>
1	5	2	1	5	4	2	<i>Air Quality Monitoring and Alarms</i>
1	5	2	1	5	4	3	<i>EH&S Special Systems</i>
1	4	2	1	5			Experimental Lab Design Package, Reports, and Reviews
1	4	2	1	1			Interim Progress Reports
1	4	2	1	2			Design Package and Final Report
1	4	2	1	3			Reviews, Meetings and Presentations
1	5	2	2				Surface Labs Design and Support: Physics Programs
1	5	2	3				Surface Labs Design and Support: Geo-Engineering
1	5	2	4				Surface Labs Design and Support: Biology
1	5	2	5				Surface Labs Design and Support: Educational Programs
1	5	2	6				4850 Lab Design and Support: Common Space and Facilities

WBS Levels							Homestake - Work Breakdown Structure (WBS)
1	2	3	4	5	6	7	DRAFT - 29-Sep-2005 (Work-in-progress)
1	5	2	7				4850 Lab Design and Support: Education and Outreach
1	5	2	8				4850 Lab Design and Support: Utilities, Technical Support and Shops
1	5	2	9				4850 Lab Design and Support: Refuge Space and Life Safety Systems
1	5	2	A				4850 Lab Design and Support: Double Beta Decay
1	5	2	B				4850 Lab Design and Support: Dark Matter
1	5	2	C				4850 Lab Design and Support: Nuclear Astrophysics Accelerators, Targets, and Detectors
1	5	2	D				4850 Lab Design and Support: Low-Background Counting - Gamma Counting
1	5	2	E				4850 Lab Design and Support: Low-Background Counting - Whole Body Counting
1	5	2	F				4850 Lab Design and Support: NNSA Applications and Homeland Security
1	5	2	G				Earth Sciences Design and Support: Geo-Exo-Biology
1	5	2	H				Earth Sciences Design and Support: Hydrology and Water Flow
1	5	2	I				Earth Sciences Design and Support: Mineralogy and Geo-Chemistry
1	5	2	J				Earth Sciences Design and Support: Geomechanics - Rock Deformation and Movement
1	5	2	K				Earth Sciences Design and Support: Mining Methods and Technology Teaching and Instruction Module
1	5	2	L				Earth Sciences Design and Support: Industrial Applications and Other Uses
1	5	2	M				Deep Lab Design and Support: Common Space and Facilities
1	5	2	N				Deep Lab Design and Support: Education and Outreach
1	5	2	O				Deep Lab Design and Support: Utilities, Technical Support and Shops
1	5	2	P				Deep Lab Design and Support: Refuge Space and Life Support Systems
1	5	2	Q				Deep Lab Design and Support: Clean Experimental Campus A - Physics
1	5	2	R				Deep Lab Design and Support: Clean Experimental Campus B - Physics
1	5	2	S				Deep Lab Design and Support: Clean Experimental Campus C - Large Experiments
1	5	2	T				Deep Lab Design and Support: Clean Experimental Campus D
1	6						Homestake Facility and Subsystems: Construction, Installation, Integration and Test
1	6	1					(Project and Subprojects Implementation - Add Detailed Scope)
1	7						Homestake Facility: Validation and Commissioning
1	7	1					(Project and Subprojects Validation and Commissioning - Add Detailed Scope)
1	8						Homestake Project Close-Out
1	8	1					Homestake Conversion and 4850 Re-Entry Project Close-out
1	8	2					Homestake 4850 Science and Engineering Labs Project Close-out (Initial Suite of Experiments)
1	8	3					Homestake Deep Labs Re-Entry Project Close-out
1	9						Homestake Pre-Operations
1	9	1					Facility Pre-Operations
1	9	1	1				Operations Management
1	9	1	2				Facility Maintenance and Operations Center
1	9	1	3				Facility Subcontracts Management: Consultants, Services, Major Procurements
1	9	1	4				Facility Contracts Technical Oversight and Integration
1	9	1	5				Facility Infrastructure Control Systems
1	9	1	6				Health Safety Management
1	9	1	7				Environment Protection Management
1	9	1	8				Information and Communication Systems Management
1	9	1	9				Technical Shops and Site Maintenance
1	9	1	A				Logistics: Transportation, Shipping & Handling Containers, Vehicles, etc.
1	9	1	B				Human Resources and Training
1	9	1	C				Visitor and User Services
1	9	1	D				Security
1	9	1	E				Property Management: Warehouse, Storage, and Inventory
1	9	2					Science Pre-Operations
1	9	2	1				Science Operations Management
1	9	2	2				Software and Data Systems Operations
1	9	2	3				Science Information Management and Archives
1	9	2	4				Experimental Systems Installation, Integration and Test, Inspection, Commissioning, Verification