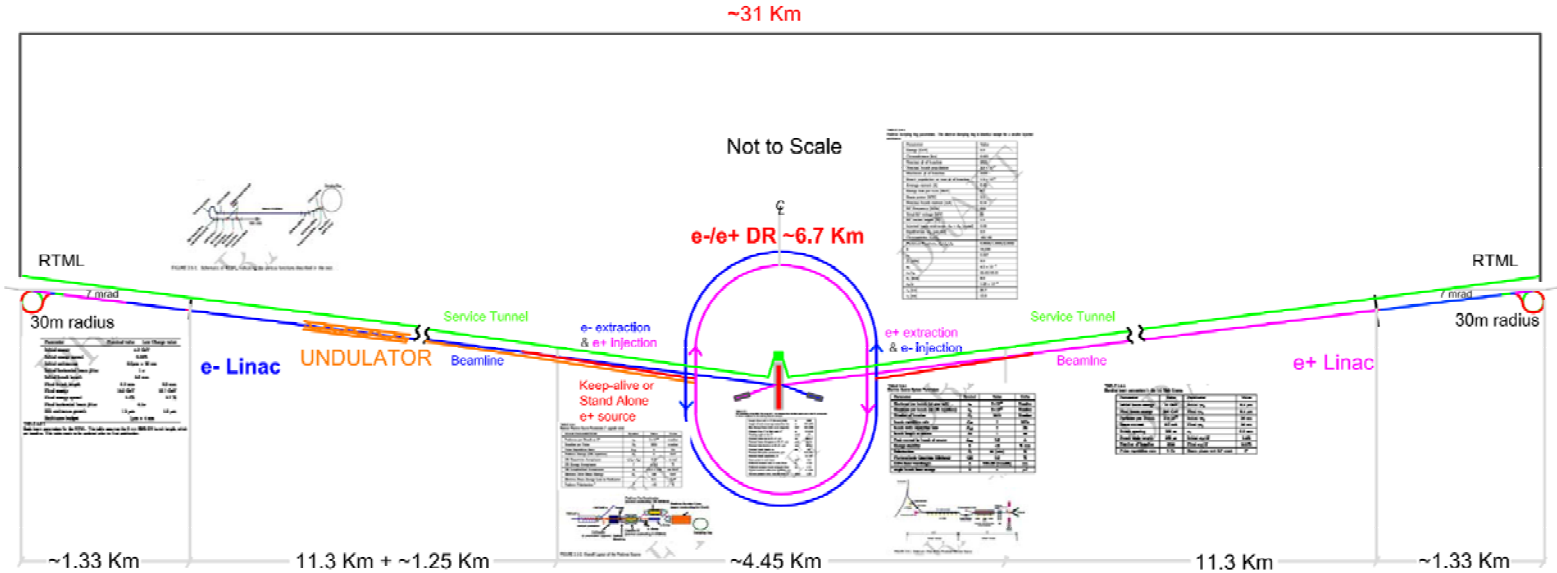
e- Source
RDR- Conventional Facility & Siting Overview

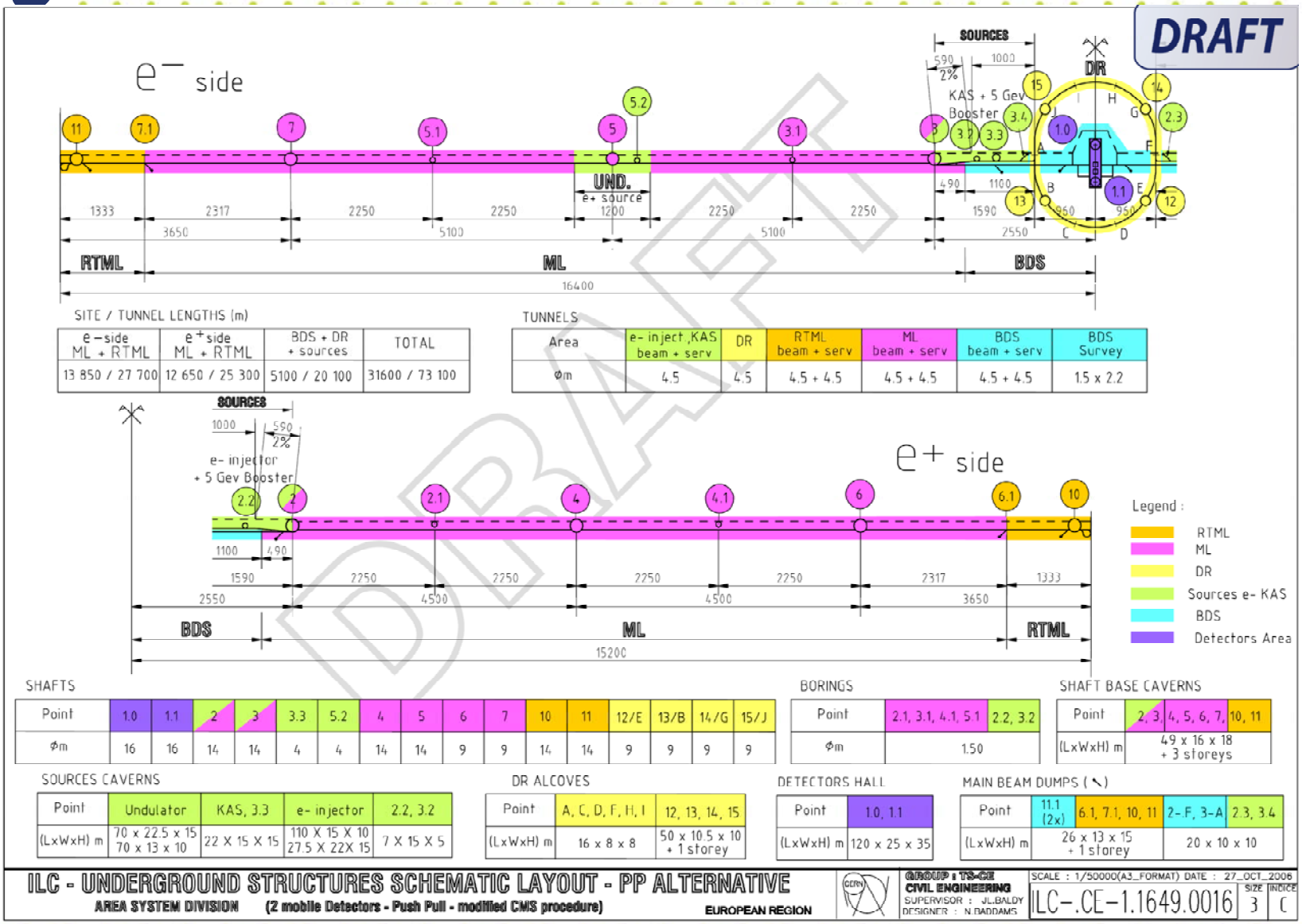
Fred Asiri/SLAC

Current Status

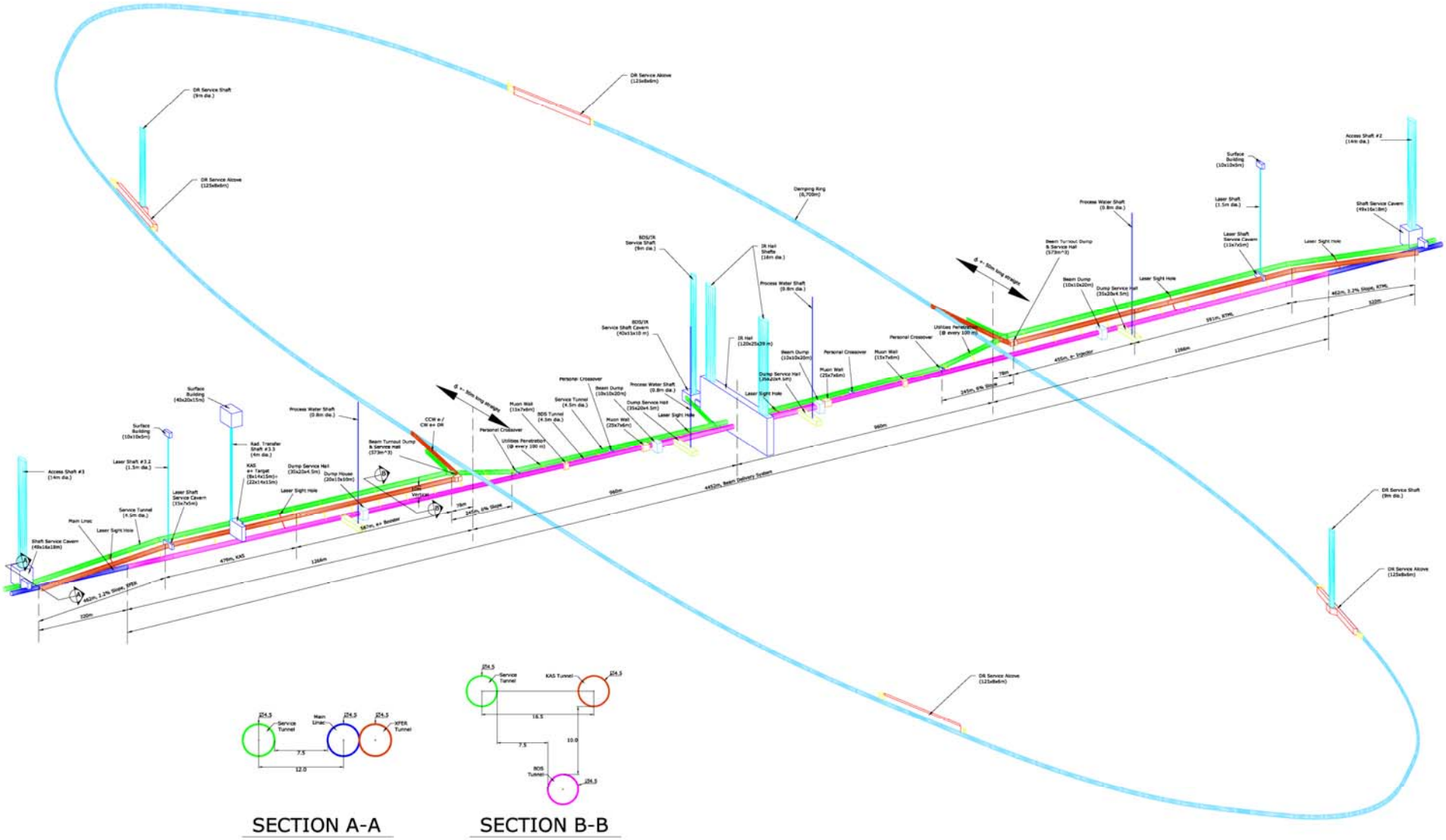


Schematic Layout - Plan View of the 500 GeV Machine

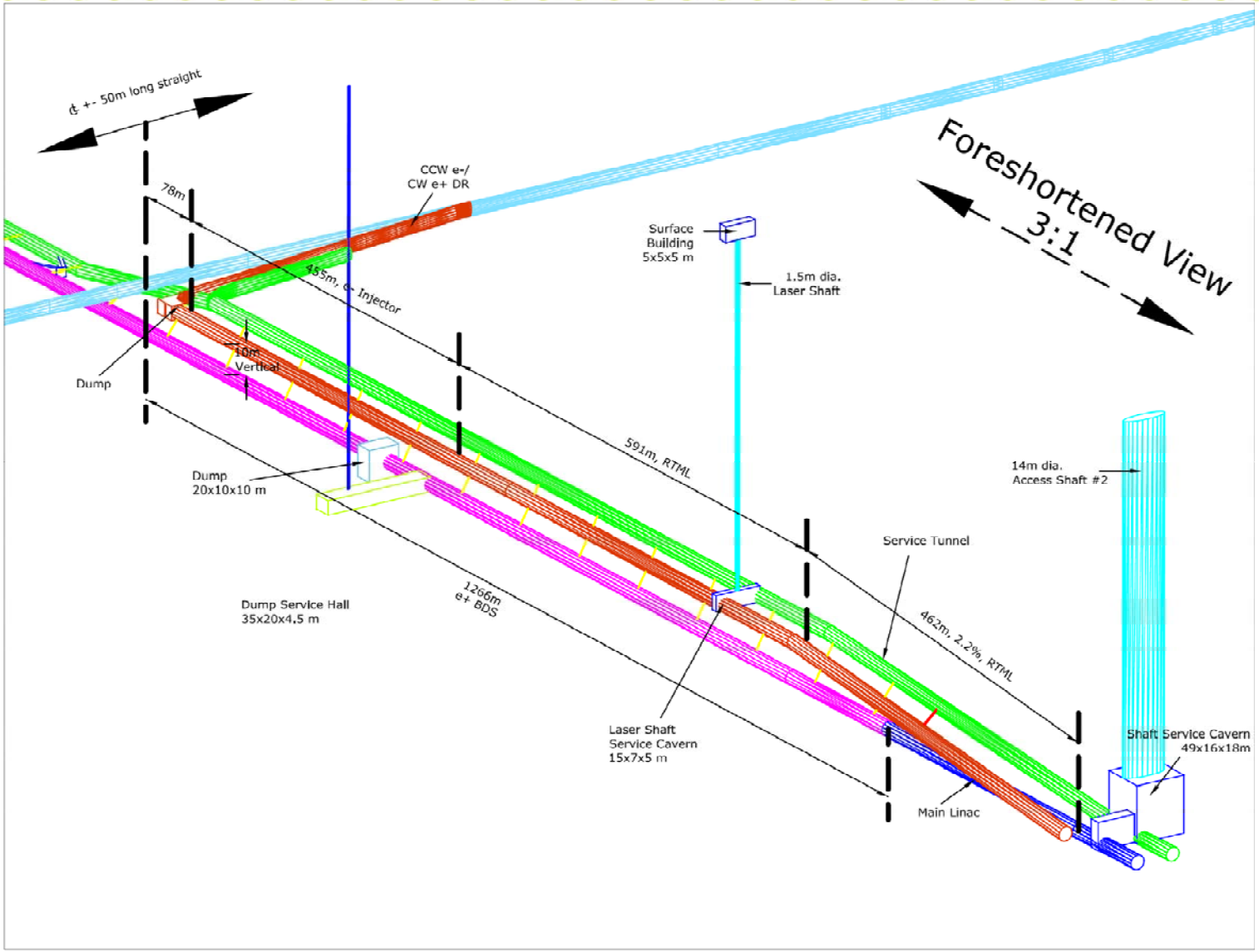
- Planning for EDR
  - **Prepare Engineering Project Description Document**
    - Defining physics requirement in RDR to engineering requirements
    - Defining boundaries, interfaces, utility needs and functional environment for each subsystem.


DRAFT
e⁻ side
SOURCES
DR
KAS + 5 Gev Booster
UND.
e+ source
RTML
ML
BDS
16400
SITE / TUNNEL LENGTHS (m)
e⁻side ML + RTML
e⁺side ML + RTML
BDS + DR + sources
TOTAL
13 850 / 27 700
12 650 / 25 300
5100 / 20 100
31600 / 73 100
TUNNELS
Area
e- inject ,KAS beam + serv
DR
RTML beam + serv
ML beam + serv
BDS beam + serv
BDS Survey
Øm
4.5
4.5
4.5 + 4.5
4.5 + 4.5
4.5 + 4.5
1.5 x 2.2
e- injector + 5 Gev Booster
e+ side
Legend :
RTML
ML
DR
Sources e- KAS
BDS
Detectors Area
SHAFTS
Point
Øm
BORINGS
Point
2.1, 3.1, 4.1, 5.1
2.2, 3.2
1.50
SHAFT BASE CAVERNS
Point
2, 3
4, 5, 6, 7,
10, 11
(LxWxH) m
49 x 16 x 18 + 3 storeys
SOURCES CAVERNS
Point
Undulator
KAS, 3.3
e- injector
2.2, 3.2
(LxWxH) m
70 x 22.5 x 15
70 x 13 x 10
22 X 15 X 15
110 X 15 X 10
27.5 X 22X 15
7 X 15 X 5
DR ALCOVES
Point
A, C, D, F, H, I
12, 13, 14, 15
(LxWxH) m
16 x 8 x 8
50 x 10.5 x 10 + 1 storey
DETECTORS HALL
Point
1.0, 1.1
(LxWxH) m
120 x 25 x 35
MAIN BEAM DUMPS (↖)
Point
11.1 (2x)
6.1, 7.1, 10, 11
2-F, 3-A
2.3, 3.4
(LxWxH) m
26 x 13 x 15 + 1 storey
20 x 10 x 10
ILC - UNDERGROUND STRUCTURES SCHEMATIC LAYOUT - PP ALTERNATIVE
AREA SYSTEM DIVISION
(2 mobile Detectors - Push Pull - modified CMS procedure)
EUROPEAN REGION
GROUP : TS-CE
CIVIL ENGINEERING
SUPERVISOR : JL.BALDY
DESIGNER : N.BADDAMS
SCALE : 1/50000(A3_FORMAT) DATE : 27_OCT_2006
ILC-.CE-1.1649.0016
SIZE 3
INDICE C

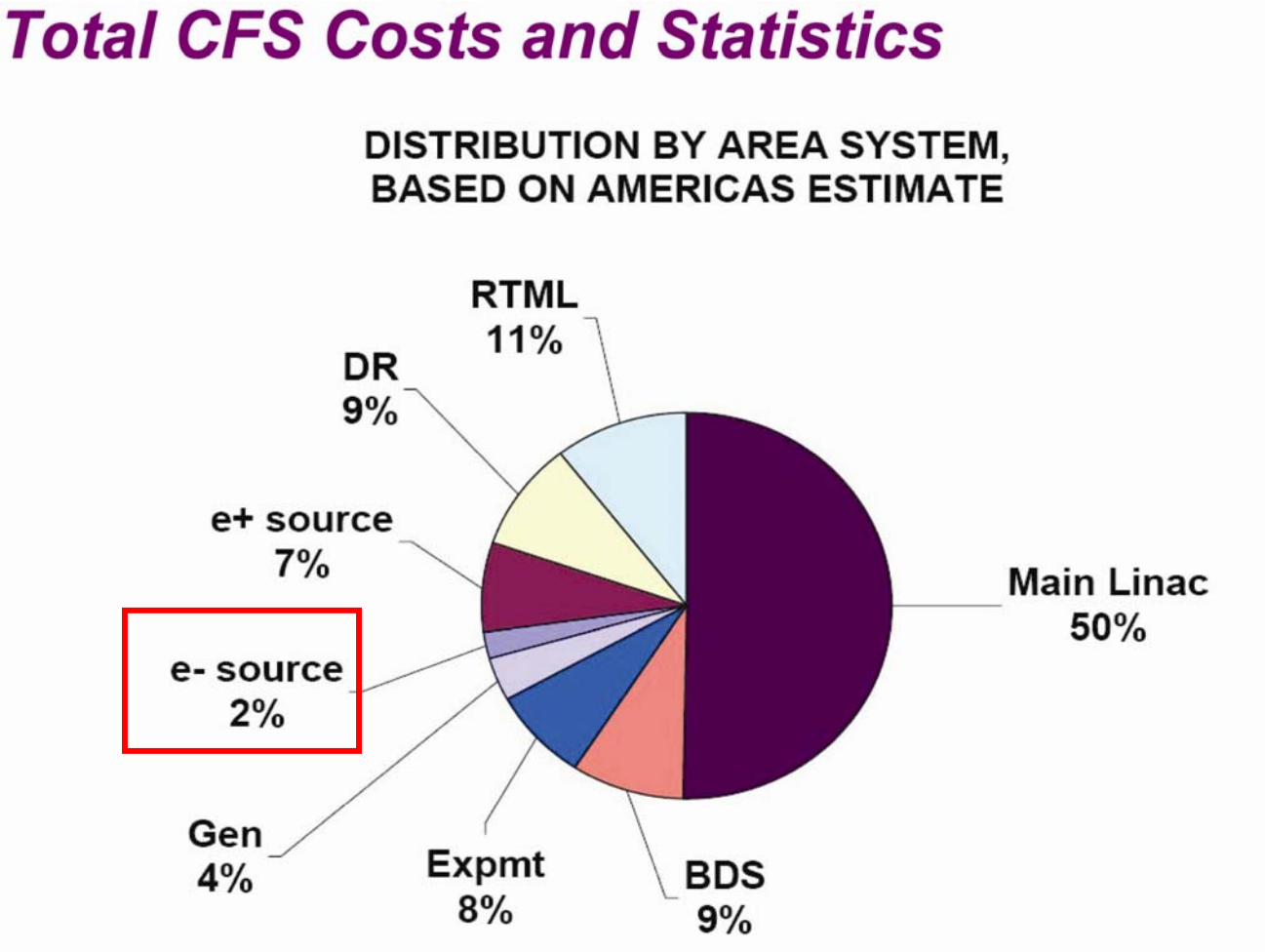
Current Status Central Area



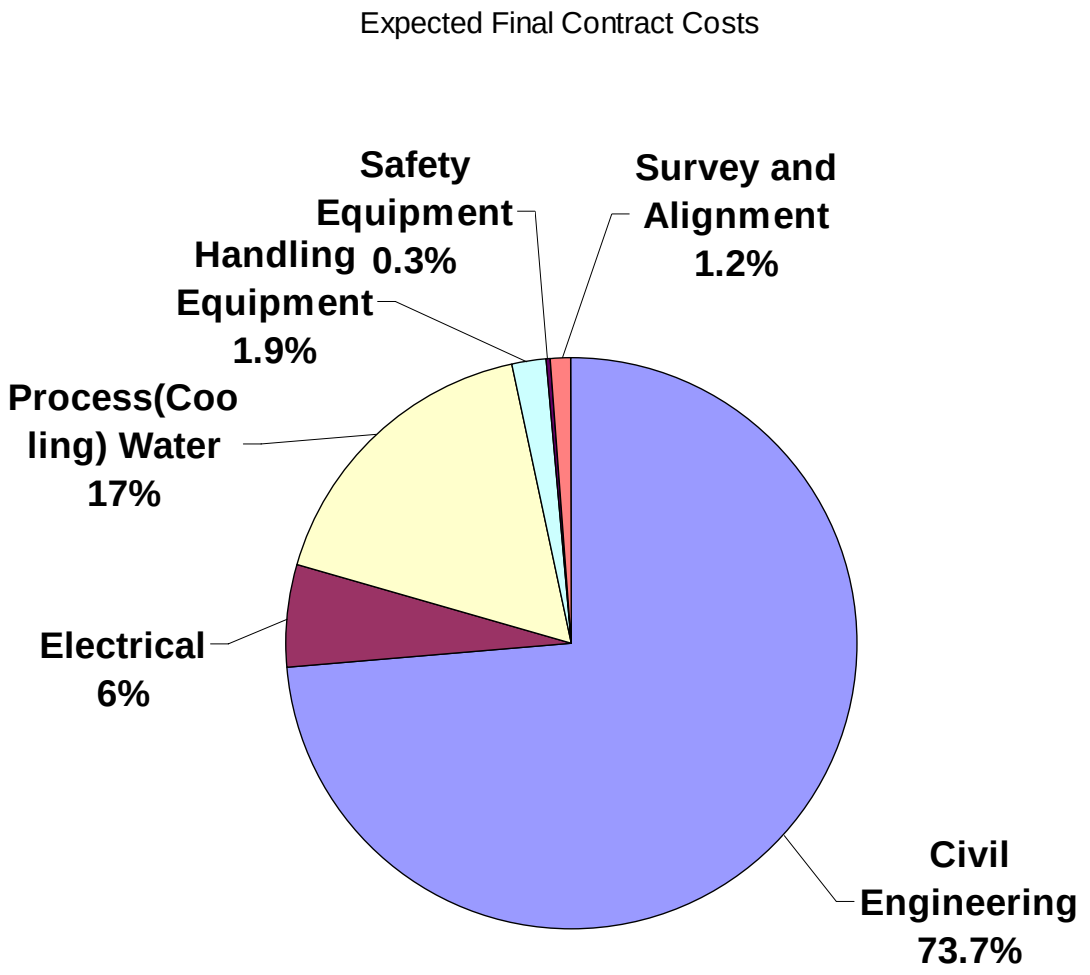
Current Status CF&S



Total CFS Costs and Statistics



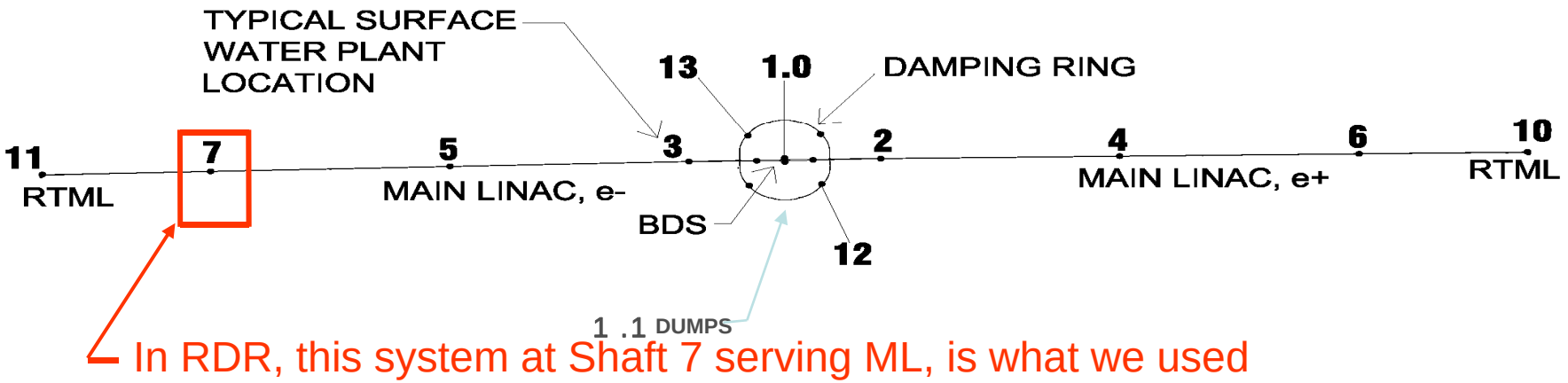
Total CFS Costs and Statistics for e- Source



Underground work is about 74% of Civil Cost

- **General Considerations**
  - Local Geology will Determine the Actual Shape of the Cavern
  - A “Dimensional Envelope” Needs to be Established for Each major component of e- source system for during;
    - Installation & Maintenance
    - Commissioning & operation
  - “Dimensional Envelope” Should Include all Supporting Utility Requirements
  - Exiting Requirements Need to be Revisited from Installation, Maintenance and Operation Point of View
- **Evolving Constraints and Criteria**
  - Life Safety Egress Requirements
  - Construction Configuration Requirements
  - Operational Configuration Requirements
- **Identification of Clear Boundaries Between CFS and Each Major Components**

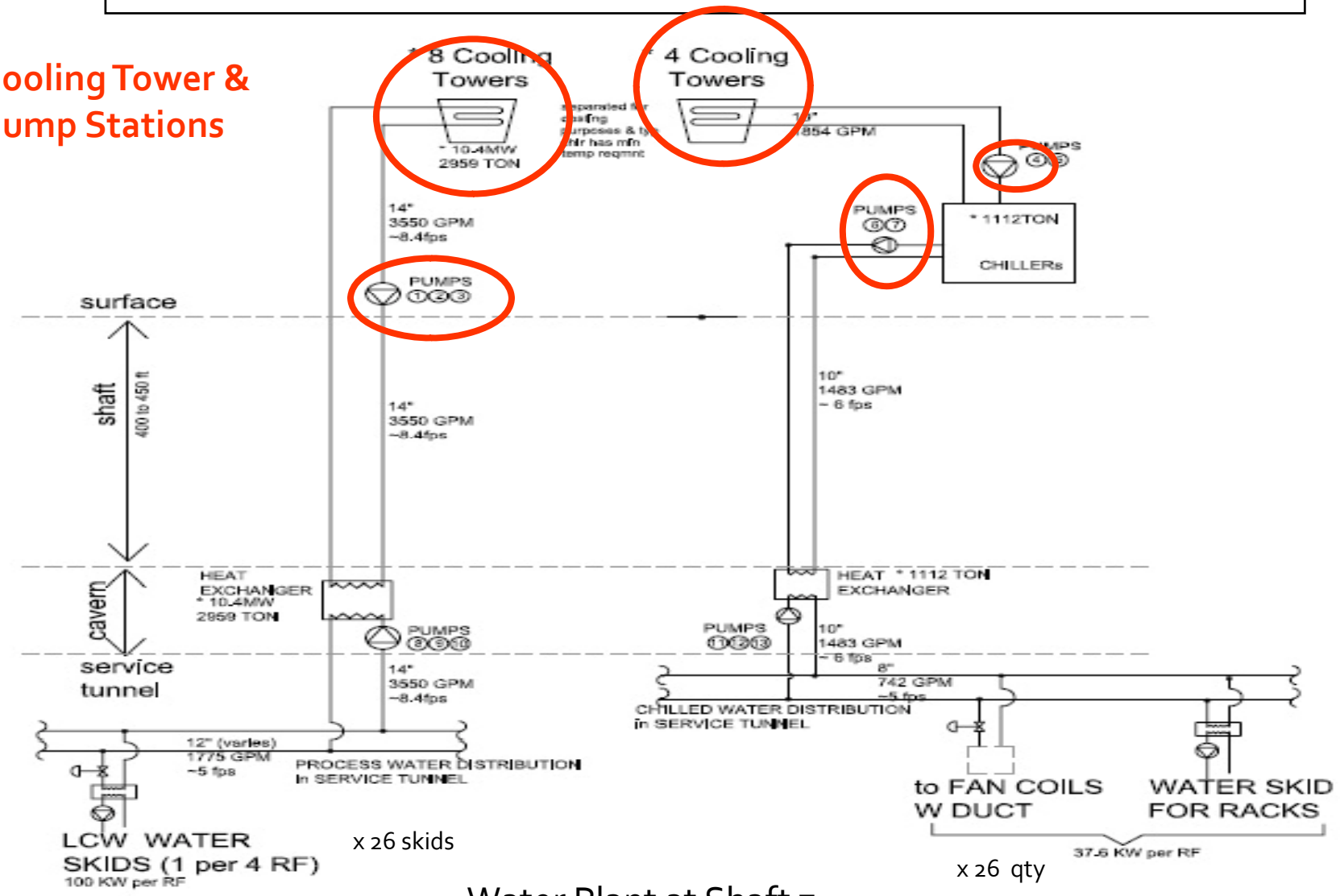
RDR Surface Water Plant locations



In RDR, we used simplified distribution by Area System

RDR Process Water Schematic

Cooling Tower & Pump Stations



Water Plant at Shaft 7

RDR Process Water Concept

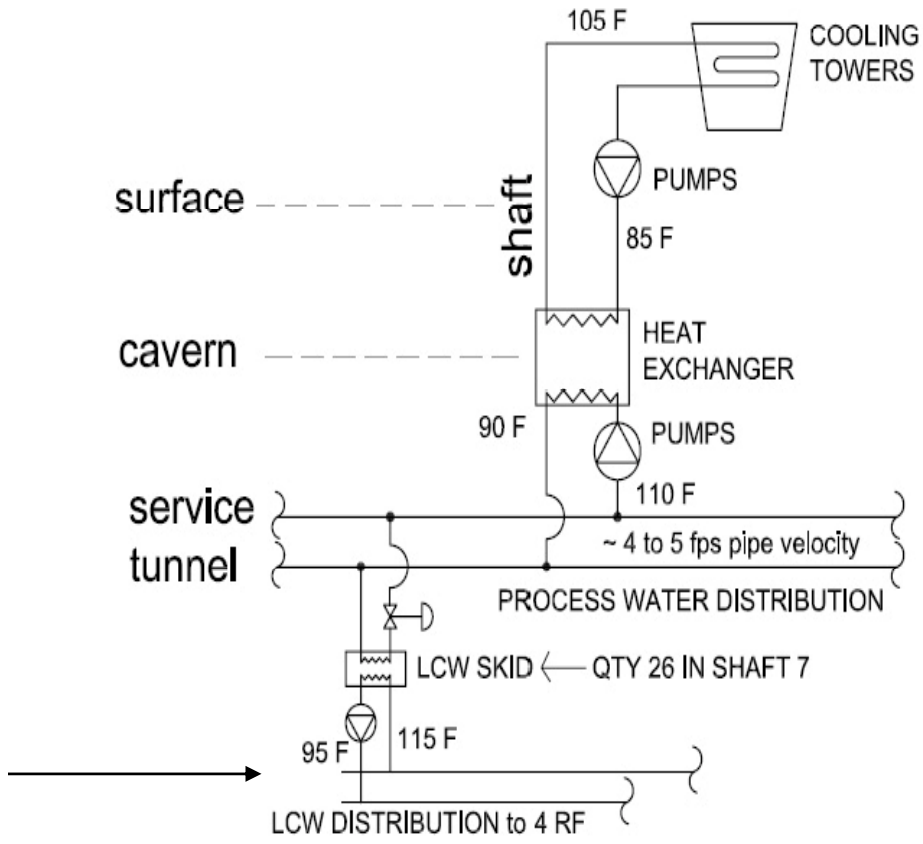
What's included

- Cooling Towers for Process Water/LCW (the chilled water is separate system)
- Pumps, surface and underground
- Heat Exchanger, LCW skid
- Piping, insulation, valves, controls and other process water accessories

What was NOT included

- Cooling tower system for Cryo

Simplified schematic based on Main Linac RF @ Shaft 7



RDR Process Water: Heat Load Basis- ML RF

Nov 27b 2006

WATER AND AIR HEAT LOAD (all LCW) and 9-8-9 ML

Components	Total Heat Load (KW)	Average Heat Load (KW)	To Low Conductivity Water: Heat Load to Water (KW)	Supply Temp (variation) (C)	Delta Temperature (C delta)	Maximum Allowable Pressure (Bar)	Typical (water) pressure drop Bar	Acceptable Temp Variation delta C	to Chilled Water: Heat Load to Water (KW)	keith Jobe load to air Nov 22 06: Power fraction to Tunnel Air (o-1)	Power to Tunnel Air (KW)
RF Components											
RF Charging Supply 34.5 Kv AC-8KV DC	4.0	4.0	2.8	40	40	18	8	10	0	0.3	1.2
Switching power supply 4kV 50kW	7.5	7.5	4.5	35	14	13	8	10	0	0.4	3.0
Modulator	7.5	7.5	4.5			28.82			0	0.4	3.0
Pulse Transformer	1.0	1.0	0.7						0	0.3	0.3
Klystron Socket Tank / Gun	1.0	1.0	0.8						0	0.2	0.2
Klystron Focusing Coil (Soler	4.0	4.0	3.6						0	0.1	0.4
Klystron Collector	58.9	47.2	45.8	*35>			2		0	0.0	1.4
Klystron Body			0.0	*35>			5	+ - 2.5 C	0		
Klystron Windows			0.0	*35>			1		0		
Relay Racks (Instrument Racks	10.0	10.0	0.0	N/A	N/A	N/A	N/A	None	11.5	-0.2	-1.5
Circulators, Attenuators & Dun	42.3	34.0	32.3					+ - 2.5 C	0	0.1	1.7
Waveguide	3.9	3.9	3.5					+ - 2.5 C	0	0.1	0.4
Total RF			100						11.50		26.07

Total Heat load to Dirty Water (per RF)		
Heat load to Chilled water (per RF)	37.6	cooled by chilled water
Heat load to LCW (per RF)	100.0	cooled by low conductivity water

RDR Process Water: Heat Load Basis- Total Loads

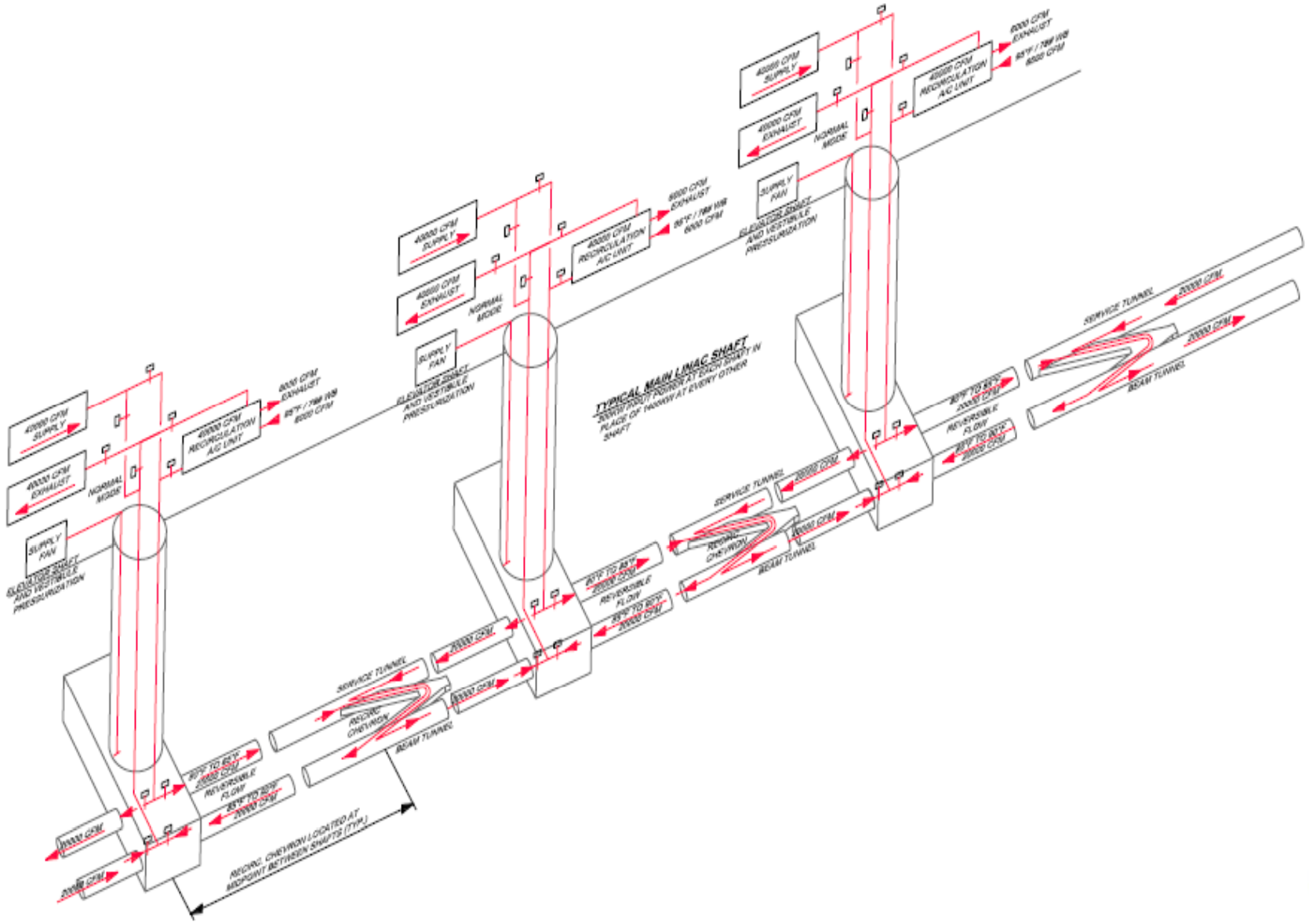
Thermal Loads used for e- Source

Area System	LCW	Chilled Water	**Total**
SOURCES e-	2.880	1.420	**4.300**
SOURCES e+	17.480	5.330	**22.810**
DR e-	8.838	0.924	**9.762**
DR e+	8.838	0.924	**9.762**
RTML	9.254	1.335	**10.589**
MAIN LINAC	56.000	21.056	**77.056**
BDS	10.290	0.982	**11.272**
DUMPS	36.000	0.000	**36.000**
	149.58	*31.971*	**182**

Air treatment Design Basis

- The design temperature for service and beam tunnels is 85-90F (29-32C). The low “heat to air” load is mainly absorbed by the tunnel wall. Air mixing fans will be used for temperature stability, possibly using process water for minor temperature adjustment.
- Used the basis that airflow could pass from the service tunnel to the beam tunnel through fire/smoke/ODH/radiation protected passages between the tunnels. This assumes that radiation/oxygen deficiency hazards (ODH) do not exist or can be mitigated between the tunnels from the standpoint of air mixing. This item needs concurrence as soon as possible.
- AHU and FCU sizes in the alcoves and tunnels did not consider Heat Rejection/Absorption into the rock wall. These units use chilled water from the surface as the heat rejection source.

CFS Air Treatment Layout



- **Air Treatment Components in RDR:**
  - Large air handling systems providing heating, cooling, dehumidification, humidification.
  - Fans for air purge, tunnel and shaft pressurization
  - Miscellaneous ducting and accessories, dampers, insulation, etc
- **Air treatment design is dependent on the ventilation requirements and the heat load criteria received from area system**
- **Air treatment and purge systems were not fully investigated for radiation issues**
- **Air treatment and purge systems configuration were not developed with consensus of any AHJ (authority having jurisdiction, even who this is may not be identified some time)**

EDR Air Treatment/CHW Summary

- **Components in EDR:**
  - Large air handling systems providing heating, cooling, dehumidification, humidification.
  - Fans for air purge, tunnel and shaft pressurization
  - Miscellaneous ducting and accessories, piping, dampers, insulation, etc
  - Chilled water systems including chillers, cooling towers, piping and accessories

- **Need further input on air flow configuration concerning radiation and ODH issues.**

- **Develop further information on required ventilation/smoke/purge/safety systems. . Need fire protection consultant**

Generic Approach for EDR Plan

Based on Systems Engineering Management Approach

- Functional Requirements Identification
- Design Configuration Control Document
- Interface Control
- Optimization Studies
  - **Design Alternatives Trade-Offs**
  - **Trade Studies**
  - **Constructability Studies**
  - **Value Engineering Study**
- Reviews (value Eng etc)
  - **Update criteria**
  - **Update baseline**
  - **Update cost**

EDR Air Treatment/CHW – Value engineering/optimization

- **Combine currently separated Fan Systems**
- **Make all chilled water aircooled**
- **Consider heat rejection to cooling ponds where possible**
- **Make dehumidification equipment desiccant type**
- **Make air handling systems chilled water instead of DX**
- **Totally Remove Chilled Water**
  - Racks still need cooler water
- **Piping Materials, why stainless, why not PVC, copper, HDPE**
- **Optimize CHW temperature for electronics and air cooling**

Tentative CF&S for EDR Plan

Concept Design Must Be Based on Validated Requirements

- **Requirements should have a range;**

  Acceptable, Preferable, Desirable