

POSSIBLE LAYOUT FOR A SURFACE CHEMISTRY LABORATORY.

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1. During the visit to Oxford of D. Hahn, K. Rowley and D. Sinclair there were discussions of the requirements and possible layout of a chemistry laboratory to be set up on the surface at Creighton Mine. The main purpose of this proposed laboratory is to provide facilities for the chemistry operations associated with the SUF rig, elution rig, solvent-solvent extraction rig, and LSC array from Oxford, and with the MnOx bead columns and LSC array and other systems from CRPP.

The objective is for these chemistry operations to be carried out in a safe and radiochemically clean environment and produce the data needed to be able to understand the background measured in the SNO detector.

2. In a discussion on April 1st one possible layout was suggested. This was based on the concept of having four rooms in series. The suggested location is in or near the existing Surface Building.

3. The first room would serve the functions of an office and sample reception room. It might therefore contain:-

2 desks.

4 chairs.

Storage cabinet.

Telephone.

Computer terminal.

Waste paper bin.

Lockers for operatives clothing.

First aid kit.

Fire extinguisher.

P.C's for the LSC arrays, on tables.

A complete set of MSDS documents for all chemicals used by SNO at the mine.

Manuals for all equipment used in the laboratory.

Catalogues from chemicals and laboratory equipment suppliers.

Reference books and directories.

Bookshelf to hold the catalogues and the reference books and directories.

4. The second room was envisaged as being sub-divided into smaller rooms with a through corridor down the middle. On one side might be a room housing the Oxford and CRPP LSC arrays and their electronics racks, plus a small bench and chair, a cupboard to contain tools, spares and test gear and an oscilloscope for use in setting up and fault-finding. On the other side could be such things as a safety shower and an eye-wash station with hand-basin and mirror, perhaps a small storeroom which could also be used to store chemicals which are used underground, and possibly a conventional shower which could also double as a changing cubicle. The safety shower could be used to wash any mine dust off the containers used for membrane transport in and out of the mine, thereby regularly testing the shower. It was not thought that it was necessary to have the drains from these to be separately contained. At present it is not very clear what level of cleanliness will be required in the laboratory and therefore what clean-room clothing and changing facilities will be needed. This requires further thought. In the interests of limiting contamination by dust and other pollutants access beyond the first room is expected to be restricted to those people who work there. —

5. The third room was proposed to be a general chemistry room. It would contain a sink and probably a fume hood, and at least four benches. There would be storage cupboards for acids, for bases and for organic solvents. There would be other cupboards holding laboratory plastic ware and any glassware needed, spares, disposables such as tubing, MediaKaps, syringes, PMP Nalgene pots, etc. A drying oven or rack might be useful. A clean air hood may also be needed, and storage for MnOx beads and columns. A small refrigerator has also been suggested. Waste bins would be needed.

Bench space is needed for a magnetic stirrer and hotplate, pipettors, balances, pH meters, etc. Some analytical instrumentation such as a small UV/vis spectrometer may also be there. An ultrasonic bath has also been proposed, for use in cleaning MnOx bead columns. A microwave oven may be used for sample concentration for the CRPP LSC array. A telephone perhaps?

This room would be used for preparing reagent solutions, for carrying out the further concentration steps on the solutions from the elution rig and solvent-solvent extraction rig, for preparing the PMP pots for the LSC arrays, for cleaning and packing the MnOx bead columns and for similar purposes. It should be supplied with conditioned air through HEPA filters. Again, what standard of clean-room cleanliness is actually needed is not very clear at present.

6. The fourth room was proposed to contain the elution rig and the solvent-solvent extraction rig, the UPW plant required, a large centrifuge for use in preparing HTiO, a sink and a bench. Because of the UPW plant this room might require three-phase power. The other rooms would, it is thought, only need single-phase power. A cupboard for spares and maintenance chemicals may also be needed. A supply of HEPA-filtered air and an exhaust hood located above the solvent-solvent extraction rig are suggested. The elution rig, UPW plant and centrifuge are all sources of noise and vibration and are best located well away from the LSC arrays and the office area. The UPW plant would be arranged to provide both RO water and 18.2 megohm.cm water in both the third and fourth rooms. Ordinary hot and cold water should be provided at the sinks and shower. A holding tank for the acidic and alkaline waste elution solutions and the solutions from the sinks is also needed, with a tank of alkaline solution mounted above it. (A 5% solution of the cheapest technical grade sodium carbonate available is suggested). This could be arranged to discharge through a small-bore solenoid valve whenever a pH sensor said the pH of the holding tank was less than say 4 or 5. It could switch on a stirrer at the same time. Storage for used organic solvents awaiting disposal is also required; a metal drum or drums is suggested. Spill kits for acids and for organic solvents should be stored here. A spill kit for bases is probably not necessary but I expect it will still appear. A set of steps will be needed.

7. A supply of nitrogen gas is required for the elution rig and the solvent-solvent extraction rig, and possibly for other purposes. Nitrogen cylinders are not very clean objects and it may be advisable to house them outside in a small wooden hut or annex and pipe the gas inside. Alternatively they could be housed in a small fifth room with its own entrance from the outside. This could also double as an emergency exit from the other rooms. Such a fifth room would have other advantages. If made a little bigger it could also house the holding/neutralisation tank and possibly the softener for the UPW plant or even the RO part of the plant and its maintenance and cleaning chemicals. Having a separate plant room in this manner would make it easier to keep the area housing the elution rig clean. Used organic solvents might also be kept here to await disposal. Bags of granular salt for the softener could also find a home here. All serious clean rooms seem to have a separate area for plant, with the services fed through the walls.

8. The original proposal for 4 rooms has now evolved into one for 5 rooms. Next action will be to circulate this to those involved in the discussions and some others whose comments and suggestions are wanted. D. Hahn will give the matter further thought on his return to BNL in the light of his earlier experiences in such proposals and D. Sinclair will compare the idealised suggestions made here with what is practicable in the space available and check any other proposals made and comments received.