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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON NUCLEAR WASTE & MATERIALS

October 18, 2007

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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 ADVISORY COMMITTEE ON NUCLEAR WASTE & MATERIALS

5 (ACNW&M)

6 183rd MEETING

7 + + + + +

8 THURSDAY,

9 OCTOBER 18, 2007

10 + + + + +

11 VOLUME III

12 + + + + +

13 The meeting was convened in Room T-2B3 of

14 Two White Flint North, 11545 Rockville Pike,

15 Rockville, Maryland at 8:30 a.m., DR. MICHAEL T. RYAN,

16 Chairman, presiding.

17 MEMBERS PRESENT:

18 MICHAEL T. RYAN, Chairman

19 ALLEN G. CROFF, Vice Chairman

20 JAMES H. CLARKE, Member

21 WILLIAM J. HINZE, Member

22 RUTH F. WEINER, Member

23

24

25

1 NRC STAFF PRESENT:

2 ANNA BRADFORD

3 CHRISTOPHER L. BROWN

4 THERON H. BROWN

5 LYDIA W. CHANG

6 NEIL M. COLEMAN

7 ANTONIO F. DIAS

8 YOIRA K. DIAZ-SANABRIA

9 DAVID W. ESH

10 JOHN H. FLACK

11 SCOTT C. FLANDERS

12 FRANK P. GILLESPIE

13 LATIF S. HAMDAN

14 AMIR KOUHESTANI

15 KAREN E. PINKSTON

16 A. CHRISTIANNE RIDGE

17 DEREK A. WIDMAYER

18

19 ALSO PRESENT:

20 STEFAN ANTON

21 KRISTOPHER W. CUMMINGS

22 KEN ROSENBERGER

23

24

25

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1 P-R-O-C-E-E-D-I-N-G-S

2 (8:30 a.m.)

3 17) OPENING REMARKS BY THE ACNW&M CHAIRMAN

4 CHAIRMAN RYAN: Good morning, everyone.
5 I guess we will get started. This meeting will come
6 to order, please. This is the third day of the 183rd
7 meeting of the Advisory Committee on Nuclear Waste and
8 Materials.

9 During today's meeting, the Committee will
10 consider the following: the Mallinckrodt site
11 decommissioning plan, the vendor's views on
12 transportation-aging-disposal performance
13 specifications, a revision of NUREG-1854, NRC staff
14 guidance for activities related to the U.S. Department
15 of Energy waste determinations. It is a draft final
16 report for interim use at this time. We will also
17 have a session discussing ACNW&M letter.

18 Derek Widmayer is the designated federal
19 official for today's session.

20 We have received no written comments or
21 requests for time to make oral statements from members
22 of the public regarding today's sessions. Should
23 anyone wish to address the Committee, please make
24 their wishes known to one of the Committee staff.

25 It is requested that speakers use one of

1 the microphones, identify themselves, and speak with
2 sufficient clarity and volume so they can be readily
3 heard. It is also requested that if you have cell
4 phones or pagers, that you kindly turn them off.
5 Feedback forms are available at the back
6 of the room for anybody who would like to provide us
7 with his or her comments about this meeting. Thank
8 you very much.
9 Without further ado, I will turn this
10 first session over to our cognizant member, Dr.
11 Clarke. Dr. Clarke?
12 MEMBER CLARKE: Thank you, Dr. Ryan.
13 18) MALLINCKRODT SITE DECOMMISSIONING PLAN
14 MEMBER CLARKE: I present to you this
15 morning Ms. Lydia Chang. Lydia is the Chief of the
16 Special Project Branch in the Decommissioning
17 Directorate, the Office of Federal and State Materials
18 in Environmental Management Programs. She will give
19 us an update on the Mallinckrodt Incorporated downtown
20 St. Louis site decommissioning project.
21 Lydia, it is a pleasure to have you here.
22 Thank you.
23 MS. CHANG: Thank you.
24 Let me just go ahead and start the
25 presentation. Today I am just going to go through

1 some of basically Mallinckrodt's overall
2 decommissioning program. And the topics that I will
3 be covering will be some site history. I think it is
4 really important to understand the history so that you
5 understand the contamination that the site involved.
6 I will give you some brief description of
7 the facilities, their decommissioning approach that
8 they have incorporated, and the decommissioning status
9 and schedules, and some of the outstanding issues that
10 we are still working on, and our plans for the path
11 forward. And, lastly, I will save some time for the
12 questions that you might have.
13 Mallinckrodt plant opened in 1867. In the
14 early stage, they were primarily a chemical plant.
15 They produced a wide range of products, including
16 product oxides, oxide salts, ammonia, organic
17 chemicals, and various uranium products.
18 Since 1940s to 1960s, they have produced
19 uranium for the Manhattan engineering district for the
20 atomic bomb research projects. During the process,
21 they have extracted uranium from ores. And the
22 contamination, that would involve uranium, thorium,
23 and its daughter products.
24 In 1956 through 1960, they were also
25 involved in extracting columbium, which is also known

1 as niobium, in addition to thallium, uranium, thorium,
2 and some rare Earth metals for the Atomic Energy
3 Commission at that time.
4 Since 1956 through 1977, Mallinckrodt was
5 involved in producing uranium and thorium salts, not
6 only for the AEC, but also they saw some portion of
7 uranium salts for commercial purposes. The maximum
8 quantities that they were allowed to sell per year
9 were 450 pounds of uranium salt and 400 pounds of
10 thorium salts.
11 In 1961 through 1985, basically they used
12 the same plant that was used for the AEA process to
13 extract columbium back 1956 and 1960s for columbium
14 and tantalum extraction, usually referred to as a C-T
15 plant. Those processes were very, very similar to the
16 one that was used during the AEA days, when they used
17 usenide in their processing, usenide ores in their
18 processing, to extract columbium at that time.
19 In 1987, they were planning to restart the
20 C-T process. They operated for two months under some
21 kind of pilot trial production run. And as a result
22 of the trial period, they decided to shut down the
23 Mallinckrodt operations permanently. At that time,
24 they also generated some limited quantity of thorium
25 and uranium contamination in the ten subcurie amounts.

1 So since 1993, Mallinckrodt has not been
2 involved in any radioactive production. They only
3 have a possession-only license for the decontamination
4 and decommissioning operations. Currently they still
5 produce a lot of products for food, cosmetic,
6 pharmaceuticals, and some specialty industrial
7 materials. And these operations do not involve
8 radioactive material.
9 The facility is pretty small. It only
10 contains about 43 acres. Its facility is on the west
11 bank of the Mississippi. It's found in the northeast
12 region of the City of St. Louis.
13 The facility is subdivided into ten
14 plants. And later I will show you on the map where
15 are those ten plants. The former C-T process, which
16 is the area that the NRC is most interested in, it's
17 only about 4.2 acres, roughly 10 percent of the total
18 site.
19 The C-T process area is primarily in plant
20 5 but also involved plants 1, 3, 6, 7 and 8 as a
21 supporting building, plant 1 being the laboratory.
22 Three is the change room area. Six is the staging
23 area that is used. Seven is the storage and they used
24 for waste stabilization. And plant 8 was the
25 maintenance area.

1 I just wanted to give you a sense of how
2 compact the area is. In the middle, this is basically
3 the plant. And, as you can see, they have railroad
4 access to the plant. This is a huge railroad spur.
5 They also have some railroad here and there.
6 In the foreground, it is the plant 6,
7 plant 7. Plant 5 is right here. It is a primary C-T
8 processing area. And plant 1, that's the laboratory,
9 plant 8 the maintenance, plant 3 the change area.
10 And, of course, 6 is the staging area. And also it
11 has some burial pit in there. And 7 was the waste
12 stabilization area and the storage unit.
13 Here are schematics to show the C-T
14 process area. Again, here is the plant 5 laboratory.
15 There is only one building that was involved, the
16 maintenance area and the change room area, here at the
17 staging area. And this is the burial site that we
18 will be discussing later on as part of license
19 amendment. And here is the waste stabilization unit
20 and, again, the railroads coming in and out of the
21 site, which it is kind of nice and kind of help with
22 the disposal transportation since they have a railroad
23 on the site.
24 Oh, one more thing. This is the west.
25 Here would be the river for the right of the railroad.

1 MEMBER HINZE: How close is it to the
2 river?
3 CHAIRMAN RYAN: It is actually east.
4 MS. CHANG: I am not so sure. Personally
5 I have never been to this site.
6 CHAIRMAN RYAN: It is pretty close.
7 MR. KOUHESTANI: It is one block.
8 CHAIRMAN RYAN: Yes. It is pretty close.
9 MR. KOUHESTANI: One large sized block.
10 MR. WIDMAYER: You need to identify
11 yourself.
12 MR. KOUHESTANI: Oh, I beg your pardon.
13 For the record, my name is Amir Kouhestani. I am the
14 current project manager for the Mallinckrodt site.
15 MS. CHANG: Actually, in the audience also
16 are Tom Youngblood and Karen. They are the technical
17 support staff reviewing the license amendments. They
18 both are HPs.
19 The decommissioning approach for
20 Mallinckrodt is that Mallinckrodt will be deluding the
21 remediate, primarily the C-T processing area under NRC
22 jurisdiction. U.S. Army Corps of Engineers will be
23 remediated in the Manhattan and related area that was
24 used for defense purposes.
25 And for the C-T process area, their

1 approach, the Mallinckrodt's approach, is to have two
2 phases. Their phase one primarily is above ground
3 dealing with the buildings and equipment. And phase
4 two would be dealing with subsurface, including the
5 buildings, slabs, and the foundations that paved the
6 surfaces and any subsurface area.
7 CHAIRMAN RYAN: Excuse me just one second.
8 I am sorry to interrupt. But we need to dial into the
9 bridge line --
10 MS. CHANG: Oh, sure.
11 CHAIRMAN RYAN: -- so other folks can
12 participate. So Theron is just going to take a second
13 to do that now.
14 (Pause.)
15 CHAIRMAN RYAN: There we go, Theron.
16 Thank you, Lydia. That just gives all of
17 our remote participants and members of the public the
18 chance to dial in if they want to. Thank you for the
19 interruption.
20 MS. CHANG: Okay. Yes. Again, the first
21 bullet is basically Mallinckrodt is in charge of
22 cleaning up the non-defense-related contamination.
23 U.S. Army Corps of Engineers is in charge of the
24 defense-related contamination, both radioactive and
25 nonradioactive materials.

1 And for the Mallinckrodt's decommissioning
2 in phase one, they will be just removing the buildings
3 or decontaminating the building and equipment above
4 ground. And phase two will be anything below grade,
5 including the building slabs and foundations or the
6 paved areas, subsurface areas. All of their
7 decommissioning goes to be able to release for
8 unrestricted use. And hopefully in the future we will
9 be able to terminate the NRC license for the site.
10 Here is just some schedule to give you a
11 sense of where we are at. For the phase one, the
12 remediation started back in July 2002 and was
13 completed a few years later, in February 2005. Phase
14 two decommissioning plan was submitted back in 2003.
15 We have not approved a decommissioning plan. There
16 were some requests for additional information back and
17 forth. And there are also some issues that need to be
18 resolved that will be touched upon later in my
19 presentation.
20 Most recently the licensee also submitted
21 a license amendment request in August 2007 to remove
22 the unreacted or in nine trenches in plant 6W.
23 In order to fully understand the
24 Mallinckrodt decommissioning approach, it is really
25 necessary to at least have some understanding of what

1 the Army Corps of Engineers and how the Mallinckrodt's
2 cleanup kind of fits in and where they have to have
3 some interactions.
4 For future remediation, even back in the
5 '50s and '60s, DOE actually has cleaned up a couple of
6 buildings. They actually cleaned plant 1 and plant 2
7 back in the '50s and '60s. They also cleaned up for
8 the old plants in 6, 7, and 4, but in the new map, it
9 is the plant 10 area. So they also have
10 decontaminated those areas back in the '60s based on
11 the standard at that time.
12 The FUSRAP program was created by Congress
13 to basically clean up and control this contamination
14 that might be left by the defense operations in the
15 weapons research projects.
16 In the early stage, DOE was involved in
17 the Mallinckrodt cleanup of the Manhattan engineering
18 district operations. And later on, it was transferred
19 to the U.S. Army Corps of Engineers in '97 in an
20 Energy Water Appropriation Act. So right now Army
21 Corps of Engineers is in charge of the whole
22 remediation program at the Mallinckrodt.
23 These are the remediation activities
24 ongoing from the U.S. Army Corps of Engineers. Right
25 here it is a schematic diagram of the FUSRAP buildings

1 that they have cleaned up.

2 And this one is kind of interesting. It

3 actually shows both the C-T production, which the

4 Mallinckrodt would be cleaning up at the site and also

5 the Army Corps of Engineers portion at the Manhattan

6 engineering district operating area.

7 From the map, we can see the dark blue

8 area. That is the C-T process area that the NRC will

9 be looking at and Mallinckrodt will be cleaning up.

10 And the blue lined area, here and there, is Army Corps

11 of Engineers. You can see for plant 6 and plant 7,

12 there are some commingled and overlapping issues that

13 need to be resolved. And that is one of the major

14 issues that we need to resolve with the Army Corps of

15 Engineers and the licensee who has that

16 responsibility.

17 And for the C-T area primarily, this is

18 plant 5, the primary C-T processing area. And, again,

19 this is the laboratory, the maintenance, the change

20 room, staging area, and also the waste stabilization

21 area. This is just a look at the building for the C-T

22 process.

23 In plant 5, I guess most importantly

24 solvent extraction, the solvent extraction was used in

25 this area and same thing with filtration. So this is

1 the primary processing area.

2 The phase one decommissioning activity
3 started back in July 2002 and completed in February of
4 2005. In phase one, several buildings were
5 demolished. Some buildings also have some surface
6 decontamination and equipment removed. Some buildings
7 also have some local decontamination performed on
8 them. There are certain areas that were also sampled
9 and deconned. Some were surveyed and released. And
10 other areas were just local survey and then released.
11 Oh, here I have a map to show you all of that.

12 The color codes are such that the red one
13 are the demolished buildings. So within those, the
14 equipment was removed. The buildings were knocked
15 down. And the debris was packaged and shipped off
16 site for disposal.

17 The pink one has some surface
18 decontamination and the equipment removed right here.
19 And the hash line here has some local decontamination
20 and equipment removal. The green one is kind of hard
21 to see. It's right here. The roof was
22 decontaminated.

23 And the blue ones, here are the blue ones.
24 Some surveys were performed and then released. And
25 the blue lined area, only local survey was necessary.

1 And then it was released for industrial use.

2 During the phase two decommissioning

3 plant, Mallinckrodt will be removing the C-T

4 processing building slabs, any sewage wastewater

5 neutralization basins, soil affected by C-T processing

6 area.

7 Here it shows all the impacted area in

8 blue. So here will be the processing area, again the

9 staging area, and the waste stabilization area, labs,

10 and also the maintenance area and change room area.

11 Early August of this year, Mallinckrodt

12 submitted a source removal license amendment

13 application to the NRC. Back in 1972 and '73,

14 Mallinckrodt buried unreacted ore in 10 6W trenches.

15 There were ten burial pits that were used. It was in

16 accordance to the old regulation 10 CFR 20.304 at that

17 time.

18 Most of the wastes were buried probably at

19 a depth of six foot. Basically they dug up a six-foot

20 trench, put a waste in there for about two feet or so,

21 and then piled and backfilled it with dirt.

22 VICE CHAIRMAN CROFF: Excuse me. What is

23 unreacted ore?

24 MS. CHANG: Those are the leftover

25 residues from the C-T processing. So basically you

1 have the solvent extraction. You have the filters.
2 It's a leftover residue that was not able to be
3 extracted.
4 VICE CHAIRMAN CROFF: Oh, I see. It's
5 more or less the raffinate or something from a solvent
6 extraction.
7 MS. CHANG: No. It's more like a solid
8 ore.
9 VICE CHAIRMAN CROFF: Okay. Well, it's to
10 precipitate a raffinate or --
11 MS. CHANG: Well, you have the ore.
12 VICE CHAIRMAN CROFF: Oh, I see.
13 MS. CHANG: And you try to extract the
14 real metal. It's the leftover. It's almost like a
15 uranium milltailing.
16 VICE CHAIRMAN CROFF: Okay. It's what
17 didn't dissolve?
18 MS. CHANG: Right.
19 VICE CHAIRMAN CROFF: Got it. Okay.
20 Thank you.
21 MS. CHANG: So the license amendment
22 request to remove this disposed unreacted ore burying
23 in the nine trenches, the tenth trench, unfortunately,
24 is under an existing building. So that still needs to
25 work out in the future.

1 Once the licensee removed those building
2 materials, then the U.S. Army Corps of Engineers would
3 be able to conduct the FUSRAP clean-up in the plant 6
4 area.
5 Here is a schematic diagram of the burial
6 site. It is a little bit hard to see. It is burial
7 1, 2, 3, 4, 5, 6. And here it will be treated as one
8 huge boundary in the amendment. And then we have pits
9 7 and 8. This is treated as a one boundary, then pit
10 9 another boundary. Pit 10 is under an existing
11 building. So right now it is not included in the
12 license amendment application.
13 I guess let me just touch a little bit on
14 this. Since this area is being remediated by FUSRAP,
15 the goal is to have delineation between Mallinckrodt
16 and the U.S. Army Corps of Engineers so that once the
17 source is removed, then the Army Corps of Engineers
18 can go ahead and do their remediation.
19 So what Mallinckrodt has been able to
20 achieve is to negotiate with Army Corps of Engineers
21 and reach some kind of consensus on what boundary they
22 basically decided on, some kind of geographical area,
23 instead of concentration but basically the dimension
24 to remove the material. So once the Mallinckrodt
25 removed the dimension, then Army Corps of Engineers

1 can move in to do what they needed to do.

2 Even though we have received the license

3 amendment, there are some inconsistent issues between

4 the delineation agreement and the license application.

5 So right now we are working with the licensee to

6 resolve the issue.

7 And, secondly, the licensee also requests

8 us to withhold the delineation agreement from public

9 disclosure and have submitted affidavits. So

10 currently we are evaluating the basis for such

11 request. So right now the delineation agreement has

12 not been released for the public.

13 Another issue is approval of phase two,

14 not only the delineations issued for the plant 6 area,

15 but it would also be an issue for the plant 7 area.

16 So that would be another thing that Mallinckrodt would

17 be working with the Corps of Engineers to resolve

18 that.

19 The path forward, basically, you know,

20 they have to come to some kind of consensus on how

21 they want to divvy up the responsibility for the

22 remaining area for the facility and also to follow up

23 the request for additional information about the

24 review in phase two DP process.

25 That concludes my presentation.

1 MEMBER CLARKE: Lydia, thank you. I guess
2 I have a general question. This decommissioning is
3 complicated due to activities that took place during
4 one period of time and activities that took place
5 after that and who is responsible for what and
6 different agencies' involvement.
7 There are other FUSRAP sites. Do they
8 deal with the same issues? This is not a unique
9 situation or is it?
10 MS. CHANG: This is actually quite unique
11 because you have commingled issues in there and they
12 --
13 MEMBER CLARKE: Okay. Because of the
14 overlap.
15 MS. CHANG: The overlap, yes. Yes,
16 especially in the vertical sense. I mean, if you have
17 overlap, you know, in the horizontal sense, it's a
18 little bit easier to develop, but this is actually in
19 vertical. So it was very difficult for the
20 Mallinckrodt to come to consensus with the U.S. Army
21 Corps of Engineers.
22 Another thing that is very difficult for
23 FUSRAP activities is that it takes a long time for the
24 Congress to allocate appropriation for the U.S. Army
25 Corps of Engineers to clean up the site. And there

1 are a lot of competing sites for the fund. So the
2 sched. is always a challenge.
3 VICE CHAIRMAN CROFF: And that is because
4 the same facilities were used for different purposes
5 at different times?
6 MS. CHANG: Right. This facility
7 basically --
8 VICE CHAIRMAN CROFF: And so you will have
9 a general area of contamination. And then there is a
10 need to sort out who did what and when they did it and
11 who is responsible.
12 MS. CHANG: Right, right. It is actually
13 two issues. One is Mallinckrodt competing with other
14 sites that Army Corps of Engineers has. So once they
15 prioritize, they may or may not be able to put their
16 fundings toward cleaning on Mallinckrodt if there are
17 other higher priority competing sites.
18 And another issue is within Mallinckrodt
19 itself. Since Mallinckrodt was used for both
20 defense-related activity and non-defense-related
21 activities, we really have two regulatory authorities.
22 One is the Army Corps of Engineers and DOE cleaning up
23 the defense-related material and the NRC trying to
24 clean up the commercial site. So there is a lot of
25 interaction that is needed to see who is doing what.

1 VICE CHAIRMAN CROFF: Well, one of the
2 things the Committee has engaged in is the, well,
3 tracking, decommissioning for different kinds of
4 facilities. But we're in the process of preparing a
5 white paper, trying to pull together a number of
6 initiatives that the NRC has undertaken.
7 And lessons learned through
8 decommissioning is a big piece. And so we would be
9 interested to hear from you at some point the lessons
10 that are learned when you have a facility that poses
11 these kinds of challenges.
12 MS. CHANG: Actually, my branch has been
13 collecting a lot of the lessons learned for the
14 decommissioning activities. And I believe one of the
15 staff has briefed the Board in the past. And
16 definitely as we learn more through the FUSRAP
17 process, we will be contributing to some of the
18 lessons learned.
19 And I think at this time, I think the
20 biggest lesson learned is to start early negotiation
21 with the Army Corps of Engineers to come up with some
22 kind of consensus early on so that we can start
23 working on the decontamination.
24 VICE CHAIRMAN CROFF: Thank you.
25 MS. CHANG: That is very time-consuming.

1 I mean, the licensee has been working long hours to
2 achieve just for the plant 6W.
3 VICE CHAIRMAN CROFF: I appreciate this.
4 I have been involved personally in a number of
5 cleanups where ownership changes took place. And not
6 so much rad but the same chemicals were used by
7 different parties for different reasons.
8 MS. CHANG: Right, right.
9 VICE CHAIRMAN CROFF: And there comes a
10 time when you have to sort all of that out, who is
11 responsible for what. So I appreciate what you are
12 dealing with.
13 Let me turn to the Committee for other
14 questions. And I am going to want to start with our
15 Chairman. Mike?
16 CHAIRMAN RYAN: Thanks. It is an
17 interesting site. It does have a long history.
18 Tell me about groundwater in this case.
19 I think it's relatively close to the Mississippi
20 River. So groundwater is an issue, I am going to
21 guess, because it is relatively close to the surface.
22 Has that made a complex problem for you or --
23 MS. CHANG: Well, I don't believe so. For
24 the FUSRAP process, they have installed a number of
25 monitoring wells and also bore hole samples. To the

1 best of my knowledge, I believe it's only one shallow
2 well that has found contamination.
3 CHAIRMAN RYAN: That is good. You know,
4 the other thing, in the history of Mallinckrodt, they
5 have done a number of clean-ups or one sort or another
6 through the years, I guess shortly after the Manhattan
7 Project work kind of ramped down and so forth.
8 I am going to guess -- and I would
9 appreciate any detail you could put to it -- that
10 early clean-up is a good thing --
11 MS. CHANG: Right.
12 CHAIRMAN RYAN: -- for any site. Have you
13 seen that kind of effect on this site that it really
14 has caused it to be probably a smaller problem than it
15 could otherwise have been?
16 MS. CHANG: I think so because for plant
17 1 and plant 2, it was cleanup back in the '50s and
18 '60s. And, as you know, plant 1, right now it is used
19 for non-radioactive industrial use purposes.
20 CHAIRMAN RYAN: I think, Jim, that would
21 be an interesting exploration for your white paper is
22 to look at this as a case where early cleanup might
23 have avoided some headaches. Mallinckrodt paid
24 particular attention to that, I think, basically at
25 the end of the war and shortly thereafter. That is

1 interesting.

2 There is one other site that is complex in

3 the same general way but not specifically. And that

4 is Cannonsburg. The Cannonsburg site in Pennsylvania

5 was used to provide Madame Curie with radium in the

6 early days and, of course, uranium later on. So it

7 was used for two different purposes, neither of which

8 were really Atomic Energy Act or Nuclear Regulatory

9 Commission-licensed, but that is one where there were

10 two distinct periods in time where the same materials

11 are handled. That is an interesting site.

12 MEMBER CLARKE: The other site that comes

13 to mind is West Valley. It's different, but it has

14 some of the same challenges.

15 CHAIRMAN RYAN: Yes, kind of. But I think

16 Cannonsburg would be one that was interesting. And

17 they actually took the uranium-bearing materials and

18 used it for fill all around Strabane and other places

19 around Cannonsburg because at that point in the '30s

20 or the '20s, it didn't have much value.

21 MS. CHANG: Right. Plus, it's a good,

22 fine material, just like milltailings.

23 CHAIRMAN RYAN: Sure.

24 (Laughter.)

25 MS. CHANG: How little do we know?

1 CHAIRMAN RYAN: Then when radium came
2 along, uranium came along as a more important
3 material. Of course, everybody has got an interest in
4 the uranium side of it.
5 That is interesting. Thanks very much.
6 Thank you, Jim.
7 MEMBER CLARKE: Thanks, Mike.
8 Allen?
9 VICE CHAIRMAN CROFF: A couple of things,
10 I guess. At this site, do they have a pretty good
11 understanding of where the subsurface contamination
12 is, where waste has been buried, and what kind of
13 waste has been buried?
14 MS. CHANG: For the waste burial, they
15 have pretty good knowledge on where, how deep the
16 dimension. I mean, that is one of the primary reasons
17 that they were able to achieve agreement with the U.S.
18 Army Corps of Engineers.
19 For contamination, I believe there are
20 bore hole samples. I could ask one of my technical
21 staff, you know. Amir, do you have any exhibits on --
22 MR. KOUHESTANI: The record is what it is
23 with respect to these ten burials in plant 6.
24 Incidentally, this is Amir Kouhestani again.
25 As you noticed in the case of

1 Westinghouse, records are kept somewhat not in the
2 fullest sense. However, surfacial gamma specs or
3 walk-overs is limited in the sense to precisely
4 determine the exact dimensions.
5 Now, my understanding is with respect to
6 this amendment that Lydia referred to, Mallinckrodt is
7 currently engaged in obtaining some additional bore
8 hole samples. And those results are in the process of
9 being reviewed by Mallinckrodt and eventually provided
10 to us.
11 But the understanding is that these nine
12 burials in three groupings will be the extent of --
13 within certain geographical boundaries and at certain
14 depths would be the limit of what Mallinckrodt has
15 proposed to remove and balance of whatever remains
16 would be Army Corps, however Army Corps, as Lydia
17 again indicated, has a different view of
18 responsibilities that it has on their FUSRAP.
19 VICE CHAIRMAN CROFF: But their
20 understanding is a lot better than, say, the Hematite
21 site, where they are not even sure they know where the
22 burial grounds are, let alone --
23 MR. KOUHESTANI: Oh, yes, sir. It is --
24 MS. CHANG: This one they definitely know
25 where they are.

1 VICE CHAIRMAN CROFF: Okay.

2 MR. KOUHESTANI: It is fair to say since
3 1992 to 2003, there have been at least to my count 13
4 campaigns of characterization, with '94 being the
5 major drive and then follow-up. We reviewed the
6 characterization plan. However, the results of the
7 characterization have remained with the licensee
8 subject to inspection.

9 VICE CHAIRMAN CROFF: Okay. And there's
10 one bore hole that showed water contamination. What
11 is the contaminant?

12 MS. CHANG: I don't know.

13 MR. KOUHESTANI: This is Amir Kouhestani.
14 It is uranium.

15 VICE CHAIRMAN CROFF: Uranium. Okay. You
16 are not seeing organics at this point?

17 MR. KOUHESTANI: NRC receives the results,
18 primarily the characterization results, including in
19 the EPR, essentially all radiological results. And I
20 can't speak to the chemicals based on the information
21 that's submitted.

22 MS. CHANG: U.S. Army Corps of Engineers
23 is in charge of cleaning up the hazards constituents.
24 NRC really does not have the regulatory authority over
25 that.

1 VICE CHAIRMAN CROFF: That must make an
2 interesting interface if they are both in the same
3 groundwater.
4 MS. CHANG: Right. That's a huge, biggest
5 challenge.
6 VICE CHAIRMAN CROFF: I see. Okay.
7 On to another area. On one slide, you
8 mentioned some slabs. Will some of these slabs be
9 left in place after remediation is complete?
10 MS. CHANG: No. I believe the slabs all
11 will be removed.
12 VICE CHAIRMAN CROFF: Slabs will be
13 removed. Okay.
14 MS. CHANG: For the heavy contaminated
15 building that was demolished, the slab would most
16 likely be removed.
17 VICE CHAIRMAN CROFF: But you noted there
18 was one burial ground that is underneath an operating
19 building.
20 MS. CHANG: Right.
21 VICE CHAIRMAN CROFF: I am assuming that
22 is going to be left there.
23 MS. CHANG: That one we really don't know
24 what the licensee is going to propose.
25 VICE CHAIRMAN CROFF: Okay.

1 MS. CHANG: And there are also diminution
2 issues associated with that. It is a currently
3 operating warehouse. And then the burial ground is
4 below ground.
5 FUSRAP is responsible for cleaning up the
6 whole area except there are some unreacted or end-up
7 aerial site that Mallinckrodt is responsible for. I
8 guess right now we are waiting for the licensee to
9 come up with a proposal.
10 VICE CHAIRMAN CROFF: Okay. And you noted
11 the interface a couple of times with the Corps of
12 Engineers. In your discussion, it was more who is
13 going to be responsible for what.
14 Isn't there going to be sort of a next
15 step in interface and consistency, where if you're
16 both remediating basically in the same area, there has
17 to be some technical consistency and sanity of the
18 approach or in the worst case where it crossed
19 purposes?
20 MS. CHANG: Right.
21 VICE CHAIRMAN CROFF: So this is going to
22 be an ongoing kind of a thing --
23 MS. CHANG: Right. We actually --
24 VICE CHAIRMAN CROFF: -- to coordinate the
25 technical approach?

1 MS. CHANG: Right. We actually have
2 constant coordination with the U.S. Army Corps of
3 Engineers headquarters on all the FUSRAP activities.
4 We also have coordinated with the regional district
5 from the U.S. Army Corps of Engineers, who is actually
6 doing the cleanup at the sites.
7 U.S. Army Corps of Engineers is using the
8 CERCLA process, therefore, or that we have to evaluate
9 relevant requirements. And NRC license determination,
10 it's one that they would have to consider.
11 MR. KOUHESTANI: This is Amir Kouhestani
12 again.
13 You have touched on a very fundamental
14 issue. Army Corps essentially followed the 40 CFR
15 192, the milltailing and, as a result, came up with a
16 series of layered concentration numbers for their
17 cleanup, surfacial, mid-depth, and at depth, with the
18 understanding that to their risk-based assessment,
19 they will achieve the NRC's standard 1402; whereas, we
20 operate obviously under our part 20 and our own dose
21 assessment.
22 So this nexus of Army Corps providing a 25
23 millirem all pathways to meet our standard using their
24 own methodologies versus us with our DCGL depth line
25 is an issue certainly which Lydia referred to as

1 commingled area and who ultimately will be responsible
2 for meeting the standard towards the license
3 determination.
4 VICE CHAIRMAN CROFF: Okay. Thanks.
5 MEMBER CLARKE: If I could just jump in,
6 you said the Corps is following the CERCLA process?
7 The site is a Superfund site?
8 MS. CHANG: It is not a Superfund MPR
9 site, but they do follow the same process as a
10 Superfund. They have done preliminary assessment,
11 site inspections, remediate investigation, and
12 feasibility study.
13 MEMBER CLARKE: Same process?
14 MS. CHANG: Exact same process. They are
15 the other lead regulatory agency.
16 MR. KOUHESTANI: This is Amir Kouhestani
17 again.
18 Per the authorization, Congress provided
19 an early transition of the program. Corps was
20 required to conduct their remediation consistent with
21 the requirements of CERCLA and NCP.
22 MEMBER CLARKE: Okay. Thank you.
23 Mike, did you want to do another one?
24 CHAIRMAN RYAN: That is fine. I am fine.
25 MEMBER CLARKE: Ruth, why don't you go

1 next?

2 MEMBER WEINER: What are the radionuclides

3 that are the contaminants? And what is the

4 radionuclide inventory of contaminants, if you would?

5 MS. CHANG: I really don't have that

6 information with me. It's uranium, thorium.

7 MEMBER WEINER: And you are cleaning up.

8 The standard to which you are cleaning up is the 25

9 millirem?

10 MS. CHANG: The 25 millirem per year.

11 MEMBER WEINER: Is that on site or off

12 site or where?

13 MS. CHANG: On site.

14 MEMBER WEINER: On site?

15 MS. CHANG: That is just in the area.

16 MEMBER WEINER: And you have all pathways,

17 which I assume would mean air and external --

18 VICE CHAIRMAN CROFF: Contaminants are --

19 MEMBER WEINER: You don't have drinking

20 water, do you?

21 MS. CHANG: No. It is an industrial area.

22 MEMBER WEINER: Yes. It is an industrial

23 area. So all of your contaminants are either dust in

24 the air or --

25 MS. CHANG: Inhalation.

1 MEMBER WEINER: -- inhalation or surface
2 contaminants.
3 MS. CHANG: Right, exposure.
4 MEMBER WEINER: Exposure. Well, the
5 buried sites wouldn't give you any exposure, would
6 they, any direct exposure, would they?
7 MS. CHANG: Probably not.
8 MEMBER WEINER: I am just a little curious
9 as to -- I mean, this is just an off-the-wall question
10 -- as to why the unreacted ore, which is basically, I
11 guess, uranium --
12 MS. CHANG: Uranium.
13 MEMBER WEINER: -- of why this is being
14 dug up and removed.
15 MS. CHANG: Because if we want to have
16 unrestricted release, in the future people want to
17 intrude into the burial site.
18 MEMBER WEINER: Okay. So you have an --
19 MS. CHANG: Industrial use.
20 MEMBER WEINER: So you have an intruder
21 standard, basically?
22 MS. CHANG: Right.
23 MEMBER WEINER: Okay. Where is the
24 material that is removed going?
25 MS. CHANG: Well, right now licensee is

1 evaluating several potential disposal locations
2 depending on the concentration.
3 MEMBER WEINER: What are those? Do you
4 know?
5 MS. CHANG: I guess it would be
6 EnviraCare, Ecology. What was the other one, Energy
7 Resource?
8 MR. KOUHESTANI: This is Amir Kouhestani
9 again.
10 Primarily Energy Solution. And in the
11 past campaigns Mallinckrodt has sent materials below
12 unimportant quantities to both U.S. Ecology Idaho as
13 well as Waste Control Specialists in Texas. Those
14 have been the three primary places.
15 As to the material and how it's been
16 categorized for the purpose of disposal, Mallinckrodt
17 has in the past essentially for materials that they
18 now in their phase two DP consider of a concentration
19 that is above the DCGL and below .05 percent waste
20 they have requested to have a blanket disposal of that
21 material if encountered to facilities other than
22 Energy Solution; i.e., the Waste Control Specialists
23 and U.S. Ecology, based on pedigree of the past.
24 MEMBER WEINER: So essentially you're
25 digging up a great deal of dirt, old tailings that

1 have relatively little contamination and shipping it
2 across the United States to a disposal site? Does
3 that pretty much describe what is going on with the
4 waste?
5 MR. KOUHESTANI: I wouldn't quite put it
6 that way, particularly with respect to the drum
7 burial, UROs concentrations are way above what in the
8 old days under the STP action plan of 30 fixed
9 programs we dealt with material. Obviously there is
10 our standard 1402 of 25 millirem. But those are
11 essentially the guiding principle in terms of the safe
12 removal of this facility.
13 MEMBER WEINER: Okay. Thank you. That's
14 all.
15 MEMBER CLARKE: Just to follow up on that,
16 isn't there a potential -- and this may not be your
17 issue -- isn't there the potential for chemicals in
18 those tailings as well depending on how those
19 extractions were done and what was used? I mean,
20 that's an issue at milltailing sites, where the
21 groundwater contamination is often the chemicals that
22 were used for the extraction, less important than
23 uranium.
24 MR. KOUHESTANI: Well, as Lydia, again,
25 mentioned, there are the aspects of FUSRAP authority

1 that deal with a material commingled with so-called
2 FUSRAP material.
3 MEMBER CLARKE: Right.
4 MR. KOUHESTANI: That could very well
5 include a certain amount of chemical, and they have
6 dealt with that.
7 MEMBER CLARKE: For example, milltailings
8 have been moved into new disposal cells for just that
9 reason.
10 Okay. Bill Hinze?
11 MEMBER HINZE: Well, to follow up on some
12 of the questions regarding the subsurface
13 contamination, is the contamination that's been
14 detected in a drill hole in the saturated or
15 unsaturated zone? Is it in the groundwater or is it
16 in the contaminated soil around the trenches?
17 MR. KOUHESTANI: I will be out of my
18 depth, but I will give you the best answer that I have
19 pending further verification with our groundwater
20 people. This one particular well was in plant 5. And
21 plant 5 again, as Lydia indicated, was the primary
22 place where -- and it is in the shallow aquifer. Army
23 Corps and FUSRAP have essentially categorized the site
24 as 2, unit A and B. Again, I would be out of my depth
25 to indulge. We can certainly respond to that, but

1 this has been in the shallow aquifer at uranium now.
2 Army Corps in their record of decision
3 established because of the record of decision not only
4 dealt with the soil operable unit, it also addressed
5 the groundwater committed to conduct a groundwater
6 remedial activities assessment short for monitoring
7 subsequent to removal of the sources as, again,
8 indicated earlier on. There is a substantial number
9 to monitor the site.
10 Corps has gone to one round of five-year
11 review. And, to my knowledge, nothing has been
12 communicated to us with respect to the result of that
13 assessment.
14 MEMBER HINZE: The monitoring of the
15 groundwater situation, then?
16 MR. KOUHESTANI: It is the responsibility
17 of the licensee to inform if there is exceedance of
18 part 20, appendix B levels. To my knowledge, we have
19 not received that indication from the licensee with
20 respect to the groundwater and the wells that they
21 have on site. And they collect samples.
22 MEMBER HINZE: I believe you mentioned
23 that there were bore holes going down. Are these for
24 the purpose of that monitoring or are they for the
25 purpose of determining the kind of movements that were

1 seen away from the trenches within the soils? I see
2 the term "soils" here, and I don't relate soils to
3 aquifers.
4 MR. KOUHESTANI: Understood. As best I
5 can answer that question subject to, again, our
6 groundwater individual associated with the project to
7 verify, there has been no, to my knowledge,
8 groundwater modeling of the site per se were these
9 wells to operate as the verification and calibration
10 of the model.
11 The notion of dropping these wells, as I
12 understand it, was as part of the Mallinckrodt overall
13 characterization of the site campaign.
14 MEMBER HINZE: Is there any evaluation of
15 how much in excess of the trenches must be dug to
16 remove contaminated material?
17 MR. KOUHESTANI: I will answer this this
18 way. If I may, in our last site visit back in May,
19 Army Corps pointed out two areas where they had dug
20 down to the depth of 18 to 20 feet.
21 So, therefore, although the initial record
22 of decision had an indication of perhaps going down as
23 deep as six, seven, or eight, as it is indicated in
24 this amendment to us that the depth that Mallinckrodt
25 will go at the very bottom of their excavation is nine

1 feet below surface.

2 But there have been instances. And that's

3 where, again, the issue becomes one of how to sort out

4 when Mallinckrodt is finished with their excavation.

5 And the Army Corps will continue on to clean up what

6 is regarded in Mallinckrodt's view as the Corps'

7 responsibility. And that is an issue to be yet

8 resolved.

9 MEMBER HINZE: So the bottom line is there

10 really is contaminated soil that exceeds the limits of

11 the trench, of the original trench, and that will be

12 excavated by Mallinckrodt. And the Corps of Engineers

13 will pick up from there.

14 MS. CHANG: Let me try to clarify a little

15 bit. Actually, Mallinckrodt is a big plant. Let me

16 just go back to the map to kind of give you a sense.

17 I mean, the trench that we are talking about, it is

18 like right around in this area, in the 6 West area.

19 So it is a very small area.

20 And I believe the bore hole sample was

21 collected throughout the plant as part of the

22 characterization work to see the --

23 MEMBER HINZE: Bore holes did you say?

24 CHAIRMAN RYAN: Yes. There's a bunch of

25 them.

1 MS. CHANG: I believe the bore holes, yes.
2 -- to see the characterization of the
3 subsurface contamination. So let's not confuse that
4 with the burial ground. The burial --
5 MEMBER HINZE: I'm not confusing it with
6 the burial ground. I'm asking the question, do you
7 know how much beyond the trenches will need to be
8 removed?
9 MS. CHANG: I think the licensee knows
10 exactly what a trench is. Right now they are
11 collecting bore hole samples to see the specific
12 concentration so that they can determine whether the
13 waste will meet certain waste acceptance criteria so
14 that they can look forward on which disposal facility
15 to get to dispose of the waste.
16 CHAIRMAN RYAN: Lydia, maybe I can help
17 out here.
18 MS. CHANG: Thank you.
19 CHAIRMAN RYAN: It seems to me that if
20 there's an excavation, whether it's under the NRC
21 license or in the FUSRAP program, Bill, it has got to
22 be a confirmatory survey to show that you're meeting
23 whatever your criteria is at the end of the day.
24 MS. CHANG: Right.
25 MEMBER HINZE: But you draw out the plan

1 beforehand how much you are going to be digging up.

2 MS. CHANG: Right.

3 MEMBER HINZE: And that's what --

4 CHAIRMAN RYAN: Absolutely.

5 MEMBER HINZE: And I don't get a good

6 sense that we have the information at hand of whether

7 we have to extend beyond the trenches or not.

8 CHAIRMAN RYAN: Could you put up the

9 photograph of the site, the aerial? I think that

10 might --

11 MS. CHANG: Aerial of the trench.

12 MR. WIDMAYER: Photograph.

13 MS. CHANG: Okay.

14 CHAIRMAN RYAN: The photograph, yes.

15 Thirty years ago, Bill, I did probably the first

16 FUSRAP survey that was done at Mallinckrodt. I spent

17 two months in the summer one summer there, '77 I think

18 it was. The railroad track that's at the bottom of

19 the picture, directly below that is the Mississippi

20 River. The land slope is sloping up back from the

21 river, pretty much through the plant.

22 MEMBER HINZE: What is the elevation of

23 the plant site above --

24 CHAIRMAN RYAN: I'm guessing now. I'm

25 guessing. It's probably, you know, 20 feet off the

river up to 30 or 40 feet up, going back at the plant. So it's relatively close. I'm guessing this unsaturated zone is relatively thin, like 10 feet or 15 feet. And if you get down to the river, it's thinner.

MEMBER HINZE: Sure.

CHAIRMAN RYAN: So it's fairly straightforward. As I recall, everybody was talking about groundwater flows being almost directly to the river. So it's a fairly straightforward thing.

So I think contamination from uphill coming downhill is the only way to look for it. And I don't have any idea what the rates might be. So I don't know if that gives you any insight that helps you a bit, but --

MEMBER HINZE: Well, there are different soils, too, and within the trenches.

CHAIRMAN RYAN: Right.

MEMBER HINZE: And so there are some of these where any contamination may not have moved far enough because of the permeabilities involved and others where --

CHAIRMAN RYAN: Oh, no.

MEMBER HINZE: -- it might be considerable.

1 CHAIRMAN RYAN: Oh, no.

2 MEMBER HINZE: So that's what I was trying

3 to get at.

4 MEMBER CLARKE: I had one question. Mike,

5 did you?

6 CHAIRMAN RYAN: I have a couple of more.

7 MEMBER CLARKE: Let me just ask one to

8 Lydia. I understand from reading some of the material

9 on the site that there is at least a discussion around

10 long-time control license, which tells us that there

11 are areas that are not going to be remediated for

12 unrestricted release. Is that correct?

13 MS. CHANG: Right now the phase two still

14 calls for unrestricted release. It is possible

15 depending on the burial pit number 10 that might have

16 impacted on the future of release.

17 MEMBER CLARKE: Okay. So it's one

18 particular area, then.

19 MS. CHANG: With the material, it's going

20 to be left on site. Then it exceeds certain dose

21 limits. Then some kind of institutional control might

22 be needed.

23 MEMBER CLARKE: Okay.

24 MS. CHANG: But right now licensee has not

25 come in to propose that yet.

1 MEMBER CLARKE: Okay.

2 CHAIRMAN RYAN: You know, we had a
3 discussion yesterday about the rulemaking that's on
4 the way. And it strikes me that 20.304 -- you know,
5 we could ask the question, well, is that a smart thing
6 to do? And that was done. Here we are digging it up
7 some 30 years or 20 years or whatever the right number
8 is later.

9 And, you know, the whole rulemaking and
10 avoiding legacy sites sort of tells you from this
11 example and maybe others don't do that anymore. Take
12 things out of the ground and get it off the ground as
13 they occur. And the Committee is thinking about those
14 issues relative to this new rulemaking.

15 Do you have any thoughts on that?

16 MS. CHANG: I think it is always the best
17 way to try to clean up the spills as soon as possible
18 because the longer you leave in place, the bigger
19 problem you are going to have.

20 So I guess in this case, it's probably the
21 right thing to try to remove the material from the
22 burial site.

23 MR. KOUHESTANI: Dr. Ryan, as a footnote,
24 State of Missouri as a matter of commenting -- and
25 they have commented in several instances; the record

1 is available on the docket -- had informed NRC that in
2 accordance with the state regulation, leaving the
3 stuff at the concentration. There would constitute
4 essentially creation of a disposal facility. In fact,
5 to that extent, they have asked for the most part all
6 the radiological contaminants to be removed from the
7 State of Missouri.
8 In another similar instance -- and we have
9 four sites in the business of FUSRAP at NRC-licensed
10 facilities. Shallow land disposal area was one that
11 Army Corps of Engineers subsequent to preparation of
12 the remedial investigation and a sense that they were
13 moving forward with unrestricted release at the
14 feasibility study thought that creation of a waste
15 cell, at three areas on that western Pennsylvania site
16 would be a good idea.
17 Certainly there was a very strong
18 registration of disagreement on the part of the state.
19 And obviously NRC asked the questions in terms of the
20 appropriateness of the application of 1403 as well as
21 the compliance with part 61 because some had shipped
22 and course-corrected and moved to unrestricted release
23 of the site and will remove the material.
24 CHAIRMAN RYAN: Yes. That is helpful for
25 the Mallinckrodt site specifically, but, really, I'm

1 asking a broader question.

2 MR. KOUHESTANI: Yes.

3 CHAIRMAN RYAN: You know, the current

4 rulemaking, I guess you could take a view that it's

5 not as encouraging in trying to get licensees to clean

6 up small issues before they become legacy issues.

7 It's something to think about.

8 MR. KOUHESTANI: I listened to the

9 discussion and how you all were grappling with the

10 issue in the space of enforcement.

11 CHAIRMAN RYAN: Again, this is a history

12 lesson that probably could inform that discussion.

13 Those are the other FUSRAP sites. I think it's also

14 interesting to note that this facility, the

15 Mallinckrodt facility in St. Louis, is the facility

16 where all of the uranium if I recall right was

17 purified for the first chain reaction in Chicago.

18 MR. KOUHESTANI: That is correct, CP-1.

19 CHAIRMAN RYAN: Yes, CP-1. So interesting

20 time for that company.

21 Thanks.

22 MS. CHANG: Thank you.

23 CHAIRMAN RYAN: Jim?

24 MEMBER CLARKE: Okay. John?

25 MR. FLACK: John Flack, ACNW staff.

1 Just a question as if the -- and I
2 understand a 25 millirem and need to clean the site
3 up, getting down to that level. What kind of
4 millirems would we be talking about or what would be
5 the dose if the site was not cleaned up, if it was
6 just left the way it was, say, on an intruder
7 scenario? For example, do you calculate? Do you make
8 those calculations how bad it would be in the sense of
9 dose that an intruder might get if they dug it up if
10 it was left in place?
11 MS. CHANG: I am really not familiar with
12 the scenarios that they used. I don't know if Karen
13 or Tom is familiar with the scenario assuming that no
14 remediation is going to be performed.
15 DR. PINKSTON: All right. This is Karen
16 Pinkston.
17 I reviewed the dose assessment. I don't
18 know if they did that calculation or if nothing was
19 removed. If you look at many of the soil samples,
20 most of them were well under -- when they did the
21 calculation of some of the fractions based on the
22 DCGLs, many of them were well under one. But I don't
23 know that they did an actual calculation of what the
24 dose would be standing on the site with no removal.
25 CHAIRMAN RYAN: But that would indicate

1 based on the summer fractions being below would be it
2 is complaint.
3 DR. PINKSTON: Or in many parts of the
4 site, there are probably hot spots that wouldn't be.
5 CHAIRMAN RYAN: Okay.
6 MR. FLACK: Okay. Thank you.
7 MEMBER CLARKE: Okay. We have reached the
8 end of our allotted time. Lydia, thank you very much.
9 CHAIRMAN RYAN: Thank you, Lydia. Thank
10 you, all.
11 Our next presentation is vendor's views on
12 the transportation, aging, and disposal performance
13 specifications. And Dr. Weiner is the cognizant
14 member for this presentation.
15 MEMBER WEINER: Thank you, Mr. Chairman.
16 19) VENDOR'S VIEWS ON THE
17 TRANSPORTATION-AGING-DISPOSAL (TAD)
18 PERFORMANCE SPECIFICATIONS
19 MEMBER WEINER: Our speaker this morning
20 is Kristopher Cummings, who is the manager of DOE
21 projects at Holtec. And he is going to address the
22 Committee on Holtec's perspective on the
23 transportation, aging, and disposal canister.
24 So, with that, Mr. Cummings, go ahead.
25 MR. CUMMINGS: Great. Thank you very

1 much. I want to thank you for the opportunity to be
2 able to present Holtec's views on the TAD concept, the
3 specification as it is, and the various issues that
4 we're going to have to deal with and are dealing with
5 currently in implementing TADs and licensing these.
6 I just wanted to note that also with me
7 today in the back is Stefan Anton, Dr. Anton, who is
8 our licensing manager; and Dr. Bill Woodward, who is
9 Vice President of International Development.
10 Brief agenda. I won't go through all of
11 these. I have a very chronological -- you know, I
12 want to give you an idea of what we have done so far,
13 including the history, give you a little bit of the
14 idea of the concept that we came up for for the aging
15 cask, the transportation cask, and the TAD canister
16 itself.
17 Specifically I want to illustrate to you
18 some of the benefits that we think Holtec brings to
19 this project for DOE. And then I want to look forward
20 a little bit and look to see what we are going to be
21 doing in the future and also what potential obstacles
22 we may have.
23 Brief history. Back in November of 2006,
24 so about a year ago, DOE issued a preliminary TAD
25 specification. And then with all of the vendors, they

1 issued a design concept contract, which we completed
2 in February and presented to them in March of this
3 year.
4 Since then they revised the TAD
5 specification, issued it as a final based on some of
6 the comments we provided and obviously some of the
7 comments that other vendors provided. And then in
8 August of this year, we submitted a TAD proposal to
9 DOE according to a solicitation that they issued. And
10 we are currently awaiting feedback on that TAD
11 proposal.
12 So from March of this year until now, we
13 have essentially not done much work. It has been
14 mostly involved with putting our proposal together for
15 DOE.
16 We developed a TAD canister design; in
17 fact, two of them. One was 21 PWR assemblies.
18 Another one was 44 BWR assemblies; an aging,
19 overpacked design. This was specifically for Yucca
20 Mountain. It would not be used at the utility sites.
21 It's too heavy. It's too big. And it doesn't have
22 various features that would be needed at the storage
23 site. You would use existing storage casks for the
24 utility sites.
25 And then a transportation overpack design

1 we also developed. And we did various scoping
2 analyses in the different disciplines to give some
3 level of confidence to DOE that the design that we had
4 come up with would meet their specification and also
5 the part 71 and 72 requirements or 71 for
6 transportation. We're not dealing with 72 here,
7 specifically with DOE. We will have to deal with that
8 and license it, but DOE is not providing any
9 jurisdiction I want to say over the storage
10 operations.
11 So these are basically what we came up
12 with. We have a storage overpack with the TAD
13 canister. You can see a lifting device on the top of
14 the TAD canister. And then with the transportation
15 overpack, that's very similar to the transportation
16 overpacks that we have now.
17 With our conceptual design, the canister
18 itself consisted of a honeycombed fuel basket, which
19 provides an uninterrupted heat transfer from the
20 center of the canister to the exterior shell of the
21 canister. That is based on our existing MPC
22 technologies. And we made use of that in our design.
23 The aging overpack is a METCON
24 constructural. It is a metal weldment that is
25 fabricated in the shop, shipped to the site empty, and

1 then filled with concrete at the site. There is no
2 rebar within the central concrete area, which could be
3 a potential cause for crack propagation.
4 The transport overpack was a layered gamma
5 and neutron shielding, specifically steel for gamma
6 shielding and Holtite, which is a Holtec-developed --
7 it's like a concrete. It's got some boron in it to
8 provide additional neutron absorption capabilities.
9 And then the construction of it was such that we have
10 top and bottom flanges that connect to a containment
11 boundary with steel shells wrapped around that.
12 In the process of revising the
13 specification from the preliminary, which we did our
14 design concept on, to the final specification, DOE
15 made some changes to the specification which were
16 based on those design concepts.
17 Of course, the biggest one was they had
18 now allowed a variable length TAD. Before they had
19 specified a length of 212 inches, no more or no less
20 outside of tolerances. But that created some real
21 complications in being able to fit that into a nuclear
22 plant and get the canister and the transfer cask out
23 of the cask.
24 So that was in response to our comments
25 that they now allow a variable length TAD and have

1 left it up to use to basically use our knowledge to
2 come up with the appropriate length and then design
3 the various overpacks to integrate that.
4 The integral lifting device, which I
5 pointed out before, that had to be welded to the top
6 of the canister. That now is removable. It needs to
7 be attached before you transport it. But that small,
8 six-inch, integral lifting device would have created
9 some interface issues at certain plants, most
10 specifically BWR plants in, again, getting it out the
11 door.
12 The trunnions on the transport cask have
13 been simplified. Before they were specified something
14 like 30 to 40 inches from the end of the cask, which
15 meant that you had to put the trunnion on the cask
16 body itself, not the upper/lower flange. They have
17 now simplified that and allowed the trunnions to be
18 placed on the flanges, which makes our impact limiter
19 design much more simple and our analysis to show that
20 we meet various transportation accident requirements
21 much easier.
22 Previously they had specified specifically
23 vacuum-drying. And they now have allowed a larger
24 range of drying options, specifically forced helium
25 dehydration. That is currently what we use and what

1 is required for high-burnup fuels. So that was a
2 needed change.
3 I believe a one-foot TAD canister drop was
4 in the preliminary spec, but they specified that
5 amount. And so the steel surface is specified.
6 The transportation cask now has upper
7 fixed trunnions similar to what you saw on the top
8 here, right here, although we can move them up now.
9 The bottom is now pocket trunnions, which allows for
10 rotation.
11 And then they added five inches to the
12 maximum diameter of the aging cask, which is
13 presumably to counter a 3g earthquake, which I will
14 mention now.
15 They added a railcar skid design. So
16 we're going to have to do some work to address the
17 railcar skid. They have added a TWPS, which is a
18 waste package spacer. Because the TADs are not 212
19 inches and the waste packages are designed for 212
20 inches, they need a spacer in there so that the
21 canister does not move around axially within the waste
22 package.
23 One of the I want to say surprises that we
24 were not aware of that was added to the final
25 specification was the aging cask now has to withstand

1 a 3g earthquake and remain upright. And it can't be
2 tied together, and it can't be anchored.
3 And so we see some challenges there. We
4 are definitely going to have to sharpen our pencil to
5 come up with an aging cask that can withstand this 3g
6 earthquake and not tip over. And then they added a
7 more severe fire scenario than what was previously in
8 the specification, but, again, we don't see that as a
9 major challenge.
10 Holtec's perspectives on the TAD concept
11 itself. Obviously the advantage of the TAD is that it
12 provides a level of standardization to aging
13 transportation and disposal but also storage.
14 One of the things that I want to point out
15 here, there has been some discussion in the public
16 that there may be the potential at some point for DOE
17 to show up with a TAD and a transportation overpack
18 and basically say, "Here you go, utilities. You load
19 it. And we will ship it off site."
20 We don't think that that will be a
21 realistic option for the majority of utility sites.
22 And the reason why is the thermal loadings, a lot of
23 storage casks are being loaded at higher and higher
24 heat loads. Nobody I believe, to my knowledge, has
25 loaded at 38 kilowatts, but we have gotten over 30

1 kilowatts.

2 Now, I use an example here that if you
3 were to load a storage cask at 38 kilowatts, the
4 transport cask you're looking at theoretically, the
5 highest that you can go is 22 kilowatts on the
6 transportation cask. That is the allowable heat load
7 that you can put in there for the canister. It would
8 take 20 years to cool from 38 kilowatts down to 22
9 kilowatts.

10 And that is not only I put this in terms
11 of heat load, but it is also a dose requirement.
12 There is part 71 dose requirements for the exterior of
13 the cask. And once you get to a high enough heat
14 load, that corresponds to higher burnup, lower cooling
15 times. And it will be very difficult to meet those
16 dose rate requirements on the outside of the
17 transportation cask when you go to higher and higher
18 heat loads.

19 An aging cask, of course, will only be
20 loaded with transportable TADs. If you can't get it
21 to Yucca Mountain, you can't put it in an aging
22 overpack.

23 And, finally, the waste package itself has
24 a thermal limit of 11.8 kilowatts. And you will
25 require an additional 30 years of cooling to go from

1 22 kilowatts to approximately 12 kilowatts.

2 So TADs provide a level of

3 standardization, but they are not a magic bullet to

4 eliminate storage at utility sites. We are still

5 going to have dry storage. And all of these utilities

6 will have their existing MPCs and various other

7 canisters out there along with TADs.

8 The vertical operations for the aging cask

9 and the transfer cask at the Yucca Mountain site,

10 which is the GROA, geological repository operations

11 area, we believe is the simplest operational sequence

12 available out there. That is the way that we have

13 been doing our casks. And we were certainly pleased

14 to see that that is the way that they are going to do

15 it out at Yucca Mountain, is vertically.

16 To be able to transport these higher heat

17 load TADs in a reasonable time frame, the canisters

18 absolutely must be loaded with regionalized loading.

19 Let me show you where you put hot fuel in the center

20 and cold fuel on the exterior.

21 Here is an example of our MPC-68, where we

22 have an inner region where you can put very

23 high-burnup fuel with low cooling times, 5 years, and

24 then on the outside, you put either low burnup or

25 longer cooling time fuel. And that helps to reduce

1 your dost rates because those fuel assemblies on the
2 outside shield the assemblies, the high radium dose
3 fuel assemblies, on the inside.
4 One of the things that we would like to
5 see, obviously, is bringing the cask, is for DOE to
6 bring the cask designers into the product development
7 process to help improve the cask design and the
8 loading process.
9 Right now the process is that DOE issues
10 a specification. The cask vendors respond to that
11 specification. And we have had a lot of industry
12 interaction, which has been absolutely essential with
13 this process, but at some point we need to be brought
14 into the fold of DOE so that we can provide our input
15 and our expertise on cask design in a way that doesn't
16 continually cycle us.
17 The aging cask has -- and they aren't
18 shown real well. On the bottom of the aging overpack,
19 which has the TAD canister, there are two inverted sea
20 channels, which are about 12 by 12 or 14 by 14, which
21 is essentially they are in there so that the aging
22 overpack could be picked up by a forklift essentially,
23 a 200 or 250-ton forklift. And as part of the
24 specification, we are required to show that the TAD
25 canister would not reach under a three-foot tip-over

1 and drop off that transport in that forklift.

2 We don't feel that this is the most

3 economical design. It puts some severe structural

4 design limitations on our design with the aging

5 overpack; whereas, all storage overpacks right now are

6 picked up from the top, either the top lid or the base

7 of the body itself, in a vertical orientation. And

8 they have a very simple process for doing that.

9 The heat load capacity -- and specifically

10 I am talking about transportation here -- is

11 specifically set by the basket material. The basket

12 material has been specified as borated stainless

13 steel. You can put aluminum in it. That's allowed.

14 But certainly there are materials out there, such as

15 Metamic, which is a metal matrix composite of aluminum

16 and B4C, that we feel can hold up very well in the

17 repository environment. We have done testing,

18 corrosion testing, on this material, likely not to the

19 extent that DOE has done on borated stainless steel in

20 previous neutron absorbers that they envisioned. But

21 we would certainly welcome the fact that Metamic were

22 added to be able to make our baskets out of that.

23 Holtec specifically has some innovations

24 in technology that will benefit DOE in this whole TAD

25 process. We developed the forced gas dehydrator or

1 forced helium dehydrator to dry the fuel. And that
2 was specifically for storage of high-burnup fuel,
3 above 45,000. And that is patented.
4 We also have patented a gamma shield cross
5 plates for the vent. It is essentially like a wine
6 crate structure made out of steel, which reduces your
7 dose rates at your vents by about an order factor of
8 two.
9 Regionalized loading. Again, I discussed
10 that with the hydro furl in the center. That will
11 lower your dose rates. Holtec was the first cask
12 vendor to successfully license that with the NRC.
13 Credit for thermosiphon effect, the
14 convective heat transfer within the basket. Holtec
15 has approved and is the only cask vendor approved with
16 a burnup credit methodology, which we used for our
17 MPC-32 to be able to transport fuel in that where you
18 have to assume that fresh, unborated water gets
19 flooded into the canister. And that would certainly
20 help us in the TAD process if burnup credit was
21 required.
22 We are currently with a cask in front of
23 the NRC right now. It's docketed with them. We're
24 addressing the use of moderator exclusion and the
25 transport of high burnup fuel.

1 We have a cask that's called our HI-STAR
2 180. We are specifically looking for burnups as high
3 as 60,000. And we are using a combination of
4 moderator exclusion and burnup credit to allow these
5 higher burnup assemblies to be transported.
6 And then we also in front of the NRC have
7 a docket related to our underground storage, which has
8 a patent pending. And I want to discuss that a little
9 bit more and specifically the applicability of the
10 underground storage facility or storage modules to the
11 aging facility at Yucca Mountain.
12 There is this concept we have had for, oh,
13 probably two years in front of the NRC, a bit longer
14 within our company. We think it logically makes sense
15 to put the canisters in what I call a subsurface
16 facility. It is not underground in the sense that
17 Yucca Mountain is underground, but it puts the fuel in
18 a protected area below the subsurface of where your
19 aging or ISFSI pad is. It produces a non-existent
20 site boundary dose because you have now got all this
21 dirt around it.
22 There is virtually zero risk of release of
23 radioactivity in terms of environmental impacts,
24 aircraft impacts, various missile impacts, which we
25 are now seeing the effects of in the dry storage

1 industry, having to address these things,
2 environmental phenomena, earthquakes, tornadoes,
3 fires, floods, all those sorts of things would have
4 little to no effect on the fuel in the canisters or
5 the canisters themselves and then certainly for the
6 Yucca Mountain site, no risk of groundwater intrusion.
7 This is designed with a thick steel container with no
8 penetrations. And certainly the Yucca Mountain site
9 is a very dry site.
10 So here is a 100U module. There is a
11 lower base plate at the bottom or a subsurface pad.
12 Let me put it that way. And then there is a
13 cylindrical steel shell that the canister goes into.
14 And then there is a top lid, which the lid that you
15 see there in its current envisionment is for part 72,
16 but you could certainly modify the lid to make it
17 heavier, beefier to meet whatever dose rates that you
18 feel are necessary.
19 Specifically in regard to the
20 specification, the 100U provides some real benefits.
21 The first, of course, is you want to have a tip-over
22 possible in a 3g earthquake because of the overpacks
23 underground.
24 We could certainly design the underground
25 module to withstand a 3g earthquake and show that the

1 amount of over-utilization that you would get in the
2 canister in the cavity that holds the TAD canister
3 would not prevent you from getting that canister back
4 out of the ground.
5 You are not going to have a three-foot
6 drop from a cask transporter because your cask
7 transporter will be transferring a transfer cask. And
8 I have some movies of the operations that you would
9 see there.
10 Of course, the 40 millirem per hour dose
11 rate would be very easily met. One of the other
12 advantages is you have a smaller land area footprint,
13 about 60 percent of the above-ground systems. And
14 that is because the above-ground systems get placed on
15 a 15-foot pitch and the below-ground system can be
16 placed on a 12-foot pitch. So you get a significant
17 land usage area that is smaller, which translates to
18 cost.
19 There is no handling of a loaded aging
20 overpack, which is 250 tons. All vertical lifts and
21 transfers, which is how everything would be done
22 vertically, would preclude any damage to the exterior
23 of the TAD canister during the transfer. And then, of
24 course, an aircraft impact would only damage the lid
25 itself and not damage the canister interior.

1 Again, what I showed you on the 100U, you
2 could make it deeper. You know, there are various
3 variables that we can improve specifically for Yucca
4 Mountain. And, of course, it makes the loading
5 operations at the repository simpler.
6 So you see here you would bring your
7 transfer cask. Now, what we have got here is a
8 HI-TRAC 125D, a 125-ton HI-TRAC that we use at the
9 utility sites. It would bring in on a cask
10 transporter either something envisioned like this or
11 something unique for Yucca Mountain.
12 It would bring it in. You would align it
13 over the top of the underground storage cavity. And
14 then you would do your TAD transfer with the cask
15 transporter itself. And then I have simplified the
16 operations here for time convenience.
17 You would then take your transfer cask off
18 the device that you have here, pull it away, and then
19 you would eventually put your lid on, which you could
20 put the lid on, actually, with the transporter itself.
21 So we feel like this is a very simple and
22 straightforward operation and such that you are not
23 moving 250-ton casks around at the aging facility.
24 I also wanted to be able to provide to you
25 some perspectives of our Holtec users groups. These

1 are our clients who currently use our dry storage at
2 their utility sites because we have our perspectives
3 as a vendor, but the utilities certainly have a
4 slightly different perspective.
5 Hands down, our utility clients welcome as
6 a concept the TAD canister and the fact that they
7 would have something sitting out on their storage pad
8 that would essentially have an imaginary sticker on it
9 saying, "Yucca Mountain-approved." This is ready to
10 not necessarily go into the mountain but be sent out
11 to Yucca Mountain. That provides them a level of
12 assurance that they are not going to have stuff
13 sitting out on their ISFSI pad for eternity.
14 The lower capacity is by far the most
15 significant issue for the utilities. A larger ISFSI
16 would be required because of the lower capacity.
17 Instead of 32 assemblies, you now load 21. Instead of
18 68, you now load 44. So you need more storage pads or
19 you need more underground storage locations.
20 More casks would be needed to load in each
21 campaign. The utilities have to load a certain number
22 of assemblies, not a certain number of casks but a
23 certain number of assemblies, each time that they do
24 a loading so that they can maintain their full reserve
25 in their pools. So before, where they had to do six

1 casks, they now need to do nine casks. And that
2 translates into needing more time to load those casks.
3 Most of our clients or a lot of our
4 clients load one cask in about three weeks on one
5 eight-hour shift. So, instead of now taking 18 weeks,
6 they now need 27 weeks. That's half a year that
7 you're loading. I mean, every year half a year you're
8 loading casks. So that is a significant issue for
9 them. And, of course, more casks mean more cost in
10 terms of operationally and having to actually buy the
11 hardware.
12 TADs themselves would have to be treated
13 as a new cask type. In terms of revising their
14 procedures, doing training, and doing various
15 engineering evaluations, they will have to revise
16 their 72-212 to show that they meet site boundary
17 doses and so on.
18 Utilities have a fairly healthy level of
19 skepticism that TADs will be realized. You know,
20 despite my first bullet that they welcome this, they
21 want to see some real progress being made.
22 I think DOE is getting there. You know,
23 they are going to do some demonstrations with the cask
24 vendors to build and load some of these, but there is
25 still some skepticism out there amongst the utilities.

1 And, of course, the incentives from DOE
2 will dictate whether the TADs are implemented by the
3 utilities. The TADs will cost more on a per-canister
4 basis. Because you need most of them, it will cost
5 more.
6 So the utility looking at it says, "I have
7 an MPC, which costs me X. I have a TAD, which costs
8 me X plus 1" or "X plus 2." So obviously DOE will
9 have to incentivize. And what those incentives are
10 will dictate whether TADs are implemented at the
11 sties.
12 Our path forward. Our ultimate goal at
13 Holtec is to submit to NRC a SAR for a transport cask
14 and a storage cask separately in December of 2008.
15 Based on the changes that DOE has made to
16 the specification and the length of the TAD canister
17 itself, we believe that we can license the TAD
18 canister and do our existing part 72 docket. It will
19 be the same exterior dimensions as our MPCs. The
20 transport cask would have to be a new docket.
21 Additionally, we will have to provide a
22 SAR-type document for the aging over-package we
23 imagine DOE will use in their part 63 license
24 application.
25 There is a large amount of work that needs

1 to be done over a very short period of time. We're in
2 October. The current deadline in the solicitation was
3 December of 2008 to have a docketed storage and
4 transportation canister. That is about a year to
5 design three overpacks and two canisters and any
6 various ancillaries that might need to be different.
7 Licensing time frame. That's from the
8 time that the NRC gets the docket to the time that we
9 would need to have a CFC in hand is about two years
10 each for license submittal, storage and transportation
11 each.
12 Potential obstacles to this process.
13 First, of course, is the NRC workload in SF/ST for
14 commercial spent nuclear fuel. They currently have
15 ten storage applications and five transport
16 applications being reviewed. And, of course, all the
17 cask vendors are expecting to submit more license
18 amendments on their existing technology, MPCs, and so
19 on.
20 TADs could involve up to eight additional
21 complex applications. The complex in there is
22 specific.
23 DOE review time. As I mentioned
24 previously, we submitted our design concept to DOE in
25 March. It is now November. And outside of writing a

1 proposal, we have not been modifying our design.

2 There is a continued start/stop process

3 related to that DOE review time. The licensing review

4 is two years. That will limit the number of

5 contentious issues that we will be able to put into

6 either the storage or the transportation application.

7 There are already contentious issues that need to be

8 included, borated stainless steel specifically being

9 one of them.

10 The question will then be under

11 transportation, are we going to want to try to bite

12 off transporting high-burnup fuel, above 45,000, if we

13 don't have a high level of confidence that we can get

14 that licensed in two years?

15 The change process. As we fabricate, we

16 will have small changes that we may need to make to

17 the casks. If we have to go back to DOE for approval

18 of every little change, that may make things

19 difficult.

20 Of course, material availability of the

21 borated stainless steel and the cost of the borated

22 stainless steel is a significant issue.

23 And then, of course, the political

24 environment is an issue. Harry Reid is Senate

25 Majority Leader. And he has made it very clear that

1 he doesn't want Yucca Mountain to occur.

2 CHAIRMAN RYAN: Kris, I want to remind you

3 this is a technical committee.

4 MR. CUMMINGS: Okay. Okay.

5 CHAIRMAN RYAN: Move along.

6 MR. CUMMINGS: Okay. No problem.

7 Final conclusions. We feel like DOE needs

8 to provide some addition confidence to the TAD

9 concept. I think I have made that clear. Changes in

10 the final specification will require redesign of the

11 transport and aging overpacks, but we have known that.

12 Submittal of the transport and storage

13 licenses to the NRC by December 2008 is achievable.

14 We think that is achievable. It is very aggressive

15 with a speedy review process and a very smooth project

16 to implementation.

17 We would certainly like to see future

18 modifications of the specification to include

19 underground aging system and higher capacity systems.

20 And, finally, we would like to see DOE get

21 the cask designers more involved in the operational

22 sequence at Yucca Mountain because we feel like we can

23 provide some benefit to them based on our years of

24 experience.

25 That is my presentation. Thank you for

1 your time. Do you have any questions?

2 MEMBER WEINER: Before I entertain

3 questions from the Committee, I would just like to

4 remind you as a point of information this Committee

5 does not advise DOE.

6 MR. CUMMINGS: We understand that.

7 MEMBER WEINER: We advise only the

8 Commission. And so that was just a final comment.

9 Mike, do you want to start off, Chair,

10 with questions?

11 CHAIRMAN RYAN: Thank you, Ruth.

12 I second Ruth's comment. This looks like

13 a presentation you should make to DOE, not us. That's

14 all.

15 MEMBER WEINER: Allen?

16 VICE CHAIRMAN CROFF: A couple of

17 questions. First, these aging overpacks you

18 mentioned, the 250-ton things, what happens when you

19 are through with them? In other words, the TAD is

20 taken out. It goes into the mountain in theory. And

21 you've got these leftover aging overpacks. What do

22 you do with them?

23 MR. CUMMINGS: You dispose of them. I

24 imagine they would not be radioactive or they would be

25 very, very lowly radioactive. At some point, they

1 would need to be gotten rid of.

2 VICE CHAIRMAN CROFF: Presumably on site

3 since they can't be moved off?

4 MR. CUMMINGS: Possibly, yes. Yes. I

5 mean, you're not going to transport them anywhere

6 without cutting them off.

7 VICE CHAIRMAN CROFF: Okay. Is there any

8 indication that is being thought about, sort of the

9 end game?

10 MR. CUMMINGS: I would have to defer to

11 DOE to answer that question.

12 VICE CHAIRMAN CROFF: Okay. Second, in

13 one of your early slides, you noted on improvements to

14 the final spec a one-foot TAD canister drop. I am

15 scratching my head a bit on that because it seems to

16 me in any case you are going to have to lift a TAD up

17 a distance much greater than one foot to either get it

18 into an aging overpack or into an underground thing,

19 whatever. Basically you have got to lift it at least

20 the length of the TAD.

21 MR. CUMMINGS: Right.

22 VICE CHAIRMAN CROFF: Are there other

23 testing requirements concerning heights and drops?

24 MR. CUMMINGS: Well, again, some of that

25 may be related to whether they have single

1 failure-proof cranes at the receipt and handling
2 facilities. And if that is the case and they have a
3 single failure-proof crane at the receipt facility,
4 then you wouldn't need to address the fact that the
5 TAD could drop while you're transferring it from a
6 transfer overpack into a storage overpack.
7 That is typically how it is dealt with in
8 the utility environment, that, for instance, our
9 current system, the transfer overpack is put on top of
10 the storage overpack. And then you transfer the MPC
11 from the transfer overpack into the storage overpack.
12 And we are not required specifically to do
13 analysis of dropping that MPC the full 18 feet into
14 the storage overpack because most, if not all, of the
15 utility sites have single failure-proof cranes.
16 VICE CHAIRMAN CROFF: Okay. Thanks.
17 MEMBER WEINER: Dr. Hinze?
18 MEMBER HINZE: A few questions, Mr.
19 Cummings. First of all, one of my concerns is the
20 corrosion of the TAD. And one of the weak points in
21 many people's view is the welds associated with the
22 lids.
23 How does your company envision that the
24 welds will be performed at the nuclear power plants?
25 How will this be effected?

1 MR. CUMMINGS: We would envision that the
2 welds, specifically the lid-to-shell weld, which is
3 the final closure weld, --
4 MEMBER HINZE: Right.
5 MR. CUMMINGS: -- would be done very
6 similar, if not identical, to the way that that MPCs
7 are welded currently. I can't speak to the corrosion
8 issues in the repository environment.
9 MEMBER HINZE: Right.
10 MR. CUMMINGS: But we have had tremendous
11 success with welding MPCs. And we don't see that the
12 welding process would be different.
13 MEMBER HINZE: Thank you.
14 A second question. If the HI-STORM 100
15 system is not accepted by DOE and we have a simple
16 aging pad that we set the overpacks on -- and you can
17 only increase the maximum diameter by five inches, as
18 I recall, something like that -- to achieve this 3g
19 threshold, it seems to me you have to lower the center
20 of gravity or that is one of the ways that you can do
21 that? And I wouldn't think that you would want to do
22 that. You wouldn't want to make the TAD with the
23 center of gravity that is highly asymmetrical.
24 MR. CUMMINGS: I don't disagree with you.
25 Certainly if we could change the distribution of the

1 weight within the aging overpack itself and limit it
2 to that versus having to make changes to the TAD
3 canister, that would certainly provide additional
4 benefits to loading those TAD canisters, then, in a
5 storage environment at the nuclear power plant.
6 MEMBER HINZE: Are you and the other
7 vendors looking at how to do that?
8 MR. CUMMINGS: We are looking at how we
9 can do that. I can't discuss, unfortunately, the
10 details.
11 MEMBER HINZE: I understand. A final
12 question. We are hearing more about the possibility
13 of puncture of the waste package by the internals
14 after corrosion, some general corrosion, has taken
15 place. I found this to be a very interesting new
16 concern.
17 Can you give us a little more information
18 on your borated stainless steel and your other
19 approaches that you had mentioned for the internals
20 and what your view of their long-term strength
21 characteristics would be and their decay, their
22 destruction, within the canister itself?
23 MR. CUMMINGS: Again, unfortunately, that
24 is not a question that I can answer. And the reason
25 why is because the cask vendors are being asked to

1 design a TAD canister, the aging overpack, and the
2 transport overpack.
3 MEMBER HINZE: But not the internals?
4 MR. CUMMINGS: Right. And the internals.
5 I agree. The thing is is that DOE is asking us to be
6 responsible to do the analysis to show that aging at
7 the Yucca Mountain repository on the aging overpack
8 and the transportation can be done safely. What
9 they're not asking us to do and what DOE is taking
10 responsibility for themselves is the actual repository
11 environment.
12 So I would imagine at some point they
13 would take our design and they would have to either do
14 some sort of analysis within the repository
15 environment or they may have already done that
16 analysis and they can show that that is applicable to
17 the canister design that we come up with.
18 MEMBER HINZE: Well, what predicated my
19 question was you talked about aluminum as an
20 alternative to the borated stainless steel. And my
21 intuitive feel is that the puncture capabilities of
22 aluminum would be far less than with borated stainless
23 steel.
24 So it seems to me that as we look at some
25 of the drift degradation problems within the

1 repository, that the strength characteristics in a
2 long-term aspect of the internals becomes an important
3 piece.
4 MEMBER WEINER: Jim?
5 MEMBER CLARKE: Could you pull up slide
6 13, please? You know, this concept of subsurface or
7 mostly subsurface spent fuels, is this purely
8 conceptual at this stage and focused totally on Yucca
9 Mountain? I guess my question is, how would the cost
10 of doing this at another location compare with the
11 typical ways of dry cask storage now?
12 MR. CUMMINGS: Let me address the first
13 question. No, it's not a conceptual design. This is
14 docketed in front of the NRC. We have gone already
15 through about two years worth of review with the NRC.
16 There were some issues with the seismic
17 analysis that we did that didn't satisfy the SF/ST to
18 the level that gave them confidence. So we went back,
19 did additional seismic analysis. And it's now in
20 front of the SF/ST again as a docket, as an amendment
21 to our existing HI-STORM 100 docket.
22 MEMBER CLARKE: Okay. Well, I guess a
23 better way that I could have asked my question is, is
24 this approach in service anywhere?
25 MR. CUMMINGS: No, it is not.

1 MEMBER CLARKE: And I guess would it be
2 cost-prohibitive for spent fuel storage at places
3 other than Yucca Mountain, I mean?
4 MR. CUMMINGS: It's based on the specific
5 site. Depending on what a site has to do to build
6 their ISFSI pack could or does affect the cost of
7 either above-ground or below-ground.
8 MEMBER CLARKE: Sure.
9 MR. CUMMINGS: And so that is done on a
10 site-by-site-specific basis. And that is a decision
11 that gets made by the utility to implement it at a
12 utility site.
13 I mean, what we are licensing now is to
14 use underground storage at the nuclear power plants.
15 And we have brought this to DOE and said we think that
16 this would be very good for the aging facility on a
17 technical basis.
18 MEMBER CLARKE: Okay. Thank you.
19 MEMBER WEINER: What are you going to do
20 about heat dissipation with that underground storage?
21 MR. CUMMINGS: The underground module is
22 constructed in such a way that if you -- let me go to
23 the next slide -- see here, there is a downcomer
24 region this is showing up, right?
25 MEMBER WEINER: Okay.

1 MR. CUMMINGS: There is a downcomer region
2 where the air gets sucked in, comes down to the bottom
3 of the storage module, and then comes up again using
4 thermosiphon effect or convective heat transfer to
5 then cool the outside of the canister, very similar
6 to, you know, our current HI-STORM overpack
7 technology, only there's vents in the bottom and vents
8 in the top. Here you only have vents in the top, but
9 you have inlet vents and you have outlet vents.
10 So we have done thermal characterization
11 and thermal analyses to optimize the size of these
12 downcomer events and the upcomer events to show that
13 we can maintain the 400 degrees C cladding limits that
14 are required for part 72. And that would certainly be
15 the same for the Yucca Mountain aging facility.
16 MEMBER WEINER: My other concern has to do
17 with the transportation. If you are doing a
18 transport, everything vertically, it is a much less
19 stable configuration than -- I mean, these are big
20 casks. You are transporting something that is five
21 meters vertical. And it seems to me that you are
22 losing a lot of stability with that. It gets back to
23 Dr. Hinze's question about the center of gravity.
24 MR. CUMMINGS: Right. And in terms of
25 normal operations, you know, moving these things

1 around, setting them on the pads, even the earthquakes
2 of 2,000-year return earthquake and 10,000-year return
3 earthquake, we have been able to show with our design
4 concept that the cask will not tip over under those
5 2,000 and 10,000-year earthquakes.
6 But the 3g earthquake is a drastically
7 more severe earthquake than the previous ones, the
8 2,000 and 10,000-year returns. So we realize that
9 there will be some issues in coming up with a design
10 that will meet that requirement.
11 We have been talking about how to address
12 that, but that is something that we would do in our
13 next phase of work with DOE.
14 MEMBER WEINER: My final question is, why
15 are you using steel as your gamma shield? Most
16 transportation casks use BU or lead. And you will
17 need more steel.
18 My guess is it's a weight difference, but
19 is there that much difference when you think about it?
20 MR. CUMMINGS: I agree. And those are
21 options that we have explored to use different
22 shielding materials for gamma shielding other than
23 steel.
24 As of this time, there are no approved
25 transportation casks for commercial spent nuclear fuel

with a uranium shield, certainly not within the major vendors who deal with this. I can't speak to lead. I don't believe there's anybody licensed with lead in their transport cask.

Now, we have licensed our transfer cask used at the utility sites with lead in it because of the gamma shielding issue. And that may be an option that we explore at some point, but, again, that gets back to the schedule issue that we have got two years to license this with the NRC. If we add lead or we add depleted uranium and it's not something SF/ST has seen before, that increases the review cycle for our cask application process.

MEMBER WEINER: I don't license casks, but we do have staff --

CHAIRMAN RYAN: Nor does this Committee.

MEMBER WEINER: Nor does this Committee, by the way.

CHAIRMAN RYAN: Or its staff.

MEMBER WEINER: But I am a little surprised to hear you say there are no licensed transportation casks that use either lead or DU. There is something.

MR. CUMMINGS: I can't speak for DOE and what they have done in the transportation casks that

1 they have, but I can say with pretty much absolute
2 certainty that there is not a transportation overpack
3 out there amongst the major vendors for commercial
4 spent nuclear fuel that uses DU.
5 MEMBER WEINER: Thank you.
6 John?
7 MR. FLACK: Yes. John Flack, ACNW staff.
8 I would just like to follow up on a
9 question that Allen Croff raised about the crane and
10 the failure in a single proof failure crane. We
11 studied those types of situations in events that have
12 occurred in the past for nuclear power plants. The
13 question, of course, is transporting casks across
14 these plants during operation.
15 We found that most of the failures, the
16 events that occurred occurred because of human error
17 and not because it was a single failure-proof crane or
18 not.
19 So eliminating these drops because they
20 are single proof failure cranes would not be
21 appropriate in these situations, I would think. But
22 how would you deal with the human error part of this
23 equation?
24 MR. CUMMINGS: That's a good question. I
25 mean, essentially the licensing that we do and the

1 analysis that we do is partly predicated on what the
2 NRC asks us to do.
3 And at this point they haven't asked us if
4 there is a single failure-proof crane to do, say, for
5 instance, a drop of a canister of 20 or 25 feet.
6 MR. FLACK: Okay. So you are not
7 eliminating these events because of single
8 failure-proof cranes? It's just that you haven't been
9 asked to do that analysis at this point?
10 MR. CUMMINGS: That's correct.
11 MR. FLACK: Okay.
12 MR. CUMMINGS: We're not saying that drop
13 can't occur. And the drop within the Yucca Mountain
14 repository would be most likely DOE's domain, but
15 that's not something that's part of this specification
16 that DOE has created to say that "You need to make
17 sure that you analyze this for a 25-foot drop." They
18 said, "You need to make sure that this will be able to
19 satisfy a one-foot drop onto a steel slab."
20 MR. FLACK: Okay. If I could have one
21 more question?
22 MEMBER WEINER: Sure.
23 MR. FLACK: Getting back to the 3g
24 earthquake, I understand the concept of trying to keep
25 it upright or not tip over. Now, I can't imagine or

1 maybe I can imagine having a cask like this on a shake
2 table that goes up to 3g. Now, I would kind of think
3 that this thing would shake apart, break apart, at
4 that level.
5 MR. CUMMINGS: The overpack itself?
6 MR. FLACK: Yes, everything. It would
7 just shake apart. Wouldn't that be the case? I mean,
8 is the point of it not falling over? I can't see the
9 relevance of that to the whole thing falling apart, I
10 mean.
11 MR. CUMMINGS: That's a good question. I
12 don't have a good understanding why the 3g earthquake
13 is in there. I can imagine operationally it would be
14 very difficult to pick up, say, 1,000 aging overpacks
15 that have all tipped over in a speedy time frame.
16 That may be the only insight that I can give into it,
17 but that is specifically something that DOE has not
18 wanted to relax that the aging overpack cannot tip
19 over under that 3g.
20 MR. FLACK: But the tipping over is a
21 criteria that's being used with success for a 3g
22 earthquake.
23 MR. CUMMINGS: There's more than just the
24 tipping over. There's also that the canister can't
25 breach and you have to maintain cladding temperatures.

1 But what I was trying to address here was specifically
2 that the 3g earthquake and not tipping over is a major
3 design challenge.
4 MR. FLACK: Okay. So are the others, I
5 would imagine.
6 MR. CUMMINGS: Some of the others are,
7 too, but that is the big one.
8 MR. FLACK: All right. Thank you.
9 MEMBER WEINER: Chris, go ahead.
10 MR. C. BROWN: Chris Brown, ACNW staff.
11 You mentioned in one of your slides that
12 you have an application in for moderated
13 exclusion/burnup credit. Is the moderated exclusion
14 portion solely based on ISG-19 or maybe an exception,
15 just out of curiosity?
16 MR. CUMMINGS: That is a good question.
17 I will probably defer that one to Dr. Anton on the
18 HI-STAR 180 and moderator exclusion.
19 DR. ANTON: It is partly based on --
20 sorry.
21 MEMBER WEINER: Would you identify
22 yourself, please?
23 DR. ANTON: This is Stefan Anton, Holtec
24 International licensing manager.
25 This is partly based on an exemption from

1 ISG-18. So we already had numerous discussions with
2 the NRC on that issue.
3 MEMBER WEINER: Further questions?
4 (No response.)
5 MEMBER WEINER: Thanks for the
6 presentation.
7 MR. CUMMINGS: Thank you very much for
8 your time.
9 CHAIRMAN RYAN: Thank you. We will take
10 a 15-minute break and reconvene at 10:40. The
11 Committee will take up its discussion of letter
12 writing and follow-up after.
13 (Whereupon, a luncheon recess was taken
14 at 10:24 a.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(1:01 p.m.)

CHAIRMAN RYAN: With that, we will open our afternoon session. Our cognizant member for this -- order, please -- is Allen Croff. Allen, take it away.

VICE CHAIRMAN CROFF: Thank you.

21) REVISION OF NUREG-1854, NRC STAFF GUIDANCE FOR ACTIVITIES RELATED TO U.S. DEPARTMENT OF ENERGY WASTE DETERMINATIONS - DRAFT FINAL REPORT FOR INTERIM USE

VICE CHAIRMAN CROFF: By way of background for the Committee, if you will remember, we have this waste incidental to reprocessing business, where DOE submits a draft waste determination and for at least two of the sites, there is a congressional act that calls for them to review it and prepare a report that goes back to the Department of Energy with their views on the draft waste determination.

Last year they created a report formerly known as a standard review plan, now known as staff guidance, that indicates how they are going to conduct this review.

It was put out for comment. They got a number of comments. And they have documented the

1 comments and the comment resolutions in a document
2 that's on our meeting CD and I assume in ADAMS
3 someplace. And what they are going to do here today
4 is to summarize those comments as sort of a close-out
5 of this part of the episode.
6 Anna, take it away.
7 MS. BRADFORD: My name is Anna Bradford.
8 I'm the Chief of the Low-Level Waste Branch in the
9 Division of Waste Management and Environmental
10 Protection.
11 Here next to me is Dr. Karen Pinkston and
12 Dr. Christianne Ridge, both of whom are systems
13 performance analysts in our Performance Assessment
14 Branch.
15 CHAIRMAN RYAN: Let me on the record say
16 congratulations for being named branch chief.
17 MS. BRADFORD: Oh, thank you.
18 CHAIRMAN RYAN: It is well-deserved --
19 MS. BRADFORD: Thank you.
20 CHAIRMAN RYAN: -- and a good recognition
21 for your ability. Thank you.
22 MS. BRADFORD: Happy to be back involved
23 with incidental waste and low-level waste.
24 CHAIRMAN RYAN: Congratulations.
25 MS. BRADFORD: It is very interesting.

1 So we are here today to give you an update
2 on the revision to NUREG-1854, NRC staff guidance for
3 activities related to U.S. Department of Energy waste
4 determinations, which was published in August.
5 I also wanted to point out that it was
6 actually Mike Fuller of my staff who was the project
7 manager for this revision of the NUREG. He is out of
8 the office this week. So I am standing in for him,
9 but he is the one who actually put all of the work
10 into this document, along with all of the technical
11 contributors.
12 As this document has evolved, we have
13 briefed the Committee several times on the staff's
14 approach and the progress, with the most recent
15 briefing being this past July.
16 And, just to clear up any confusion, like
17 Dr. Croff said, this document was previously called a
18 "standard review plan" for NRC activities related to
19 waste determinations. We decided to change that title
20 just because the information in this document didn't
21 really fit into the typical mold of NRC's standard
22 review plan.
23 The main focus of today's briefing is on
24 the most significant changes from the last version of
25 the guidance and this most recent version. I am going

1 to spend a minute or two giving a background, some
2 background information on the NUREG, and then an
3 overview of the comments that we received during the
4 public comment period.
5 I am also going to describe the most
6 recent staff activities with respect to waste
7 determinations because those activities did help
8 inform our revisions to the guidance.
9 I am not going to describe the National
10 Defense Authorization Act of Fiscal Year '05 or the
11 NRC's responsibilities because I know the Committee is
12 very familiar with those topics.
13 Then Christianne is going to talk about
14 some of the more important information in the
15 guidance: performance assessment, the removal of
16 radionuclides from the waste, as well as our
17 monitoring activities with respect to DOE's disposal
18 actions. And then Karen is going to talk about the
19 concentration averaging guidance, which, as you know,
20 can be a very complicated issue with respect to waste
21 determinations.
22 So, as you heard us say before, the
23 objective of NUREG-1854 is to ensure consistency of
24 NRC staff reviews, of waste determinations submitted
25 to us by DOE. It is also to help ensure consistency

1 of our monitoring activities of DOE's disposal
2 actions. It also is an important tool for us to
3 facilitate knowledge transfer among the staff as the
4 number of staff working on these problems has
5 increased over the last year or two.
6 So the NUREG was published as a draft
7 standard review plan. And that was put out for public
8 comment in May 2006. The public comment period lasted
9 until July 31st, 2006.
10 During that comment period, we received 12
11 comment letters. We also took part in interactions
12 with key stakeholders, both during and after the
13 public comment period. And I will talk more about
14 those in a moment. And, as you know, the ACNW
15 provided us some feedback and recommendations in a
16 letter in December 2006.
17 So we took all the comments that we
18 received, regrouped them by subject. We developed
19 responses to those comments as well as revised the
20 guidance as appropriate according to the comments that
21 we received. Those comments and responses are now in
22 appendix C to the NUREG.
23 We published the NUREG this past August.
24 We titled it "Draft Final for Interim Use." And the
25 reason we used the draft final designation was because

1 we do plan to revise it again once we have completed
2 the work on some generic technical issues that we
3 think will help inform us for revisions in the future
4 of this document.
5 As I said, we received 12 comment letters
6 during the public comment period. Four of those were
7 from states: Idaho, New York, Washington, Oregon. In
8 general, the states all supported the contents of the
9 SRP, the technical contents. Oregon did raise some
10 concerns about the application of the SRP to Hanford
11 because, as you know, the NDAA does not apply to
12 Hanford. And they were concerned that we were
13 equating Hanford with the Savannah River site and with
14 Idaho.
15 We received one letter from DOE, which
16 raised concerns about how we were implementing the
17 NDAA in general. And also they were concerned that
18 the SRP implied that we were regulating DOE when, in
19 fact, we are not regulating DOE with respect to waste
20 determinations.
21 We received one letter from the West
22 Valley Citizen Task Force, which is a group that is
23 very involved in the cleanup of the West Valley site
24 up in New York. They also liked the technical
25 contents of the SRP, but they in general to not

1 support the overall idea of WIR and being able to
2 classify this waste as incidental in dispose of it on
3 site.
4 We received one letter from the Natural
5 Resources Defense Council. They have been an
6 important stakeholder in waste determinations. They
7 are especially interested in our role in reviewing
8 waste determinations. But, again, they do not support
9 just the overall concept of incidental waste.
10 And then we received five letters from
11 private citizens. And the comments in there ranged
12 from waste volume left in tanks to groundwater
13 transferred at Hanford to our monitoring activities.
14 As I mentioned, we took part and completed
15 some very important activities between the last
16 version of the guidance and this most recent version.
17 For example, we issued the technical evaluation report
18 for waste determination for tank closure at Idaho.
19 And this was the first review we completed for tank
20 closure under the NDAA.
21 We also issued and implemented monitoring
22 plans for salt stimulase at the Savannah River site
23 and for the Idaho tanks. We have gone out to Idaho
24 twice to audit their activities. And we have issued
25 two observation reports that discuss our findings.

1 And, actually, implementing our monitoring role helped
2 us sharpen the related discussion in the NUREG.
3 We also issued in the Spring of 2006 a
4 request for additional information for tanks 18 and 19
5 at Savannah River. And subsequently DOE decided not
6 to go forward with that waste determination as
7 submitted. So that review has not continued, but we
8 did gain some value experience just from completing
9 the first part of that review.
10 We have also held discussions with DOE
11 regarding technical issues, which may affect waste
12 determinations that DOE submits to us in the future.
13 For example, we have discussed
14 concentration averaging with them. And those
15 discussions have been valuable in helping us clarify
16 our positions to DOE and letting us better understand
17 how they were reading and interpreting the guidance.
18 We have also held two public meetings with
19 DOE to discuss the consultation process in general.
20 The most recent one of those was in July. And during
21 that meeting, we allotted time for public comments.
22 And we did receive some comments on the NUREG during
23 that meeting.
24 I am now going to turn this to Christianne
25 to talk about the details of performance assessment.

1 DR. RIDGE: Good afternoon. I am going to
2 speak about some of the changes we have made in three
3 areas, in the performance assessment area, in the area
4 of radionuclide removal, and in monitoring. Dr Esh,
5 of course, was the author and chief reviser of most of
6 the performance assessment guidance that I am going to
7 talk about today.
8 One of the main changes we made in the
9 performance assessment area -- actually, there were
10 very few changes in the philosophy of the performance
11 assessment area or in the technical guidance. Most of
12 the changes in this area were an expansion of
13 clarification or the previous guidance. An example of
14 that is that we expanded the guidance regarding the
15 advantages of probabilistic analyses and the
16 disadvantages or challenges associated with
17 deterministic analyses.
18 For example, we expanded the guidance
19 regarding the need to assemble appropriate
20 combinations of parameters to examine and if you are
21 looking at a deterministic approach.
22 We also expanded the guidance about how to
23 look at these deterministic analyses. And we
24 emphasize the evaluation of whether assumptions that
25 are said to be conservative are conservative,

1 especially looking to whether or not they are
2 conservative only locally or globally because, of
3 course, this can be a difficult thing to look at in a
4 deterministic analysis.
5 For example, if you assume a waste form is
6 completely saturated, that can appear to be a
7 conservative assumption. And it is with respect to
8 the relative porosity of the waste, but if you assume
9 it's saturated, you have also eliminated gas-based
10 transport in the waste form. And that can be a
11 difficulty because you might limit the amount of
12 oxidation or carbonation that occurs to the waste
13 form. So we have added more detail and emphasized the
14 need to look at whether these assumptions are actually
15 conservative globally.
16 We have also emphasized the recommendation
17 that reviewers use independent, probabilistic analyses
18 to identify risk-significant assumptions when DOE does
19 submit a deterministic analysis, many of these changes
20 -- and the added emphasis was in response to ACNW
21 comments.
22 We have also made some clarifications in
23 the area of dose calculation. The Committee had
24 expressed a concern that there was a disconnect
25 between the regulation and part 61, which has limits

1 that were based on ICRP 2. And 61.43, of course,
2 worker dose, is expressed as TEDE, total effective
3 dose equivalent, because it's performed under DOE's
4 regulation, 10 CFR part 35. The Committee expressed
5 concern about that disconnect.
6 We have in the guidance previously -- and
7 we have clarified this and emphasized this a bit --
8 expressed the view that the NRC believes that it is
9 appropriate to use the 25 millirem TEDE limit as
10 essentially not equivalent but as an alternative to
11 using the 25 millirem whole body and the 75 millirem
12 thyroid and the 25 millirem organ doses. That
13 precedent actually comes from the proposed rule for
14 part 63.
15 We have emphasize in the revision that the
16 dose calculations may be based on the dosimetry
17 consistent with ICRP 26 and 30 or the more current
18 dosimetry consistent with ICRP 72. And, actually, in
19 that emphasis, we are following direct Commission
20 direction. The Commission had previously directed us
21 to make sure we maintained the flexibility for DOE to
22 use the dosimetry consistent with ICRP 72.
23 I would just like to point out that the
24 two waste determinations that we have reviewed so far
25 pursuant to the NDAA, in those two determinations, DOE

1 has used dose methodology consistent with ICRP 26 and
2 30. And so there doesn't actually seem to be much of
3 a concern that they would want to use the older ICRP
4 2 methodology that is what the part 61 limits were
5 based on.
6 In addition to these comments that we
7 received from the Committee, we also made changes
8 based on our previous experience. Two topics that we
9 have had a lot of technical interaction with DOE about
10 in previous reviews have been grout degradation and
11 the point of compliance. These certainly aren't the
12 only two, but these are two main areas where we have
13 had a lot of interaction with them. And we,
14 therefore, wanted to clarify our guidance.
15 With respect to grout degradation, we have
16 added more specific guidance related to specific
17 degradation mechanisms, such as wet/dry cycling or
18 carbonation. We have added a little bit more specific
19 guidance there. And we have also emphasized a bit
20 more the guidance related to the mean to modeling the
21 uncertainty in degradation effects.
22 And some of those sources of uncertainty;
23 for instance, uncertainty, in the environment with
24 respect to subsurface carbon dioxide concentrations,
25 for instance, or the moisture environment at the site.

1 And so we have emphasized the need to understand those
2 sources of uncertainty and to carry those through into
3 the performance assessment modeling.
4 With respect to the point of compliance,
5 we have emphasized that the size of a buffer zone
6 around the waste needs to be consistent with its
7 purpose, which is given in part 61. The purpose of a
8 buffer zone, as given in part 61, is to provide an
9 area for monitoring and for any necessary mitigation
10 that needs to take place.
11 And so there is no strict limit on what we
12 require for a buffer zone. We continue to expect it
13 to be approximately 100 meters, which is what was used
14 in the part 61 EIS, but we certainly would be amenable
15 to evaluating other buffer zone sizes. We are guided
16 by the purpose of the buffer zone, which is given in
17 part 61.
18 And, of course, as you know, the size of
19 the point of compliance is related to institutional
20 controls because where a member of the public can be
21 is limited by DOE's institutional control of the site.
22 We have not made any changes in the
23 guidance regarding our assumption of institutional
24 controls, again, in that we are guided by part 61,
25 which indicates that institutional controls should not

1 be assumed to be maintained more than 100 years after
2 site closure and in that we're guided largely by the
3 discussion in the environmental impact statement for
4 part 61, which indicates, in part, that the question
5 of institutional controls is not really meant to be an
6 estimate of how long the government will survive.
7 And, of course, in part 61, it was assumed
8 that the government would take ownership of these
9 commercial low-level waste sites. And so the question
10 is not really one of how long the government will
11 stand but of how long it should be responsible for
12 maintaining the site, how long it should be
13 responsible for the waste. And so we haven't changed
14 any of our guidance on that topic.
15 We also received public comments related
16 to performance assessment. There were public comments
17 on both procedural and technical topics. We did
18 receive a number of comments about the public
19 availability of documents. And we have emphasized in
20 our guidance that our technical evaluation reports,
21 documents we get from DOE during the waste
22 determination review, are made public.
23 We also received some comments about the
24 funding for DOE to pursue waste cleanup and for NRC to
25 review it. And those were largely outside the scope,

1 but we did receive public interest on a number of
2 procedural topics, those being two examples.
3 We also received public comments on
4 specific technical topics. And in many of those
5 cases, we thought there were some good points made.
6 And we incorporated more specific guidance into the
7 guidance documents. For instance, we added some
8 specific reference to looking for manmade preferential
9 flow pathways, such as well casings or certainly at
10 the DOE sites, there is a great deal of underground
11 piping, the effects of co-containments on radionuclide
12 transport, for instance, if there are any effects of
13 organic solvents that have been spilled on the site.
14 We received comments about
15 evapotranspirative barriers and a suggestion that we
16 include the effects of anthropogenic climate change in
17 our review.
18 On that last topic, anthropogenic climate
19 change, we are following the lead so far of the
20 high-level waste program in that our understanding is
21 that we expect that the effects of anthropogenic
22 climate change will be to change the timing of any
23 large changes in the climate that happen naturally.
24 And so we would expect that DOE would look
25 for any sensitivity to the timing of changes in the

1 climate that are expected but that other than that, we
2 expect that there is so much uncertainty in the
3 prediction of the climate change, that looking at the
4 effects of anthropogenic climate change is
5 essentially taken care of by looking at the
6 uncertainty in what future climate states may be.
7 There were also a few changes to the
8 radionuclide removal section. As you will recall,
9 radionuclide removal is required. Radionuclide
10 removal to the maximum extent practicable and, more
11 specifically, highly radioactive radionuclide removal,
12 to the maximum extent practicable is required by
13 criterion 2 of the NDAA.
14 And there were a few changes here, one in
15 the area of technology selection and removal
16 efficiencies. We incorporated the ACNW's
17 recommendations about technology selection, one of
18 those recommendations being that DOE should evaluate
19 a suite of technologies and not pick one single
20 technology that they think will --
21 CHAIRMAN RYAN: I need to interrupt you.
22 I'm sorry. We need to turn on the line so folks so
23 can dial into to the presentation.
24 DR. RIDGE: Oh, of course.
25 CHAIRMAN RYAN: So if you don't mind,

1 Theron is going to come in and just dial it up. So I
2 apologize.
3 DR. RIDGE: No problem.
4 CHAIRMAN RYAN: We didn't have anybody
5 scheduled, but they have called in to the office. And
6 we need to hook them up.
7 (Pause.)
8 CHAIRMAN RYAN: Good afternoon.
9 MR. ROSENBERGER: Hey, how are you doing?
10 CHAIRMAN RYAN: This is Mike Ryan. We are
11 already underway just for a few minutes. Could you
12 tell us who you are and who you are with?
13 MR. ROSENBERGER: Yes. This is Ken
14 Rosenberger, Savannah River site.
15 CHAIRMAN RYAN: Welcome, Ken. We will
16 pick up right from here. Thanks for joining us.
17 MR. ROSENBERGER: Thanks, Mike.
18 CHAIRMAN RYAN: Christianne, thank you for
19 your patience.
20 DR. RIDGE: No trouble. I think I was
21 saying that we have incorporated the ACNW
22 recommendations about technology selection,
23 specifically that in our review we should look to and
24 in our analysis DOE should look to international
25 sources, industrial sources for ideas of what

1 technologies could be used, and also that they should
2 consider a suite of technologies and not one single
3 technology. Those are all good suggestions, and we
4 incorporated them directly.
5 We also clarified the guidance about
6 removal efficiencies. The ACNW has expressed some
7 concern, I believe, that we are overemphasizing
8 removal efficiencies and that removal efficiencies are
9 not a direct measure of risk, with which we agree.
10 And it was, in fact, never our intention that we would
11 say, for instance, DOE has removed 99 percent of the
12 activity and that is our measure and, therefore, they
13 are done and they have removed radionuclides to the
14 maximum extent practicable.
15 So we clarified in our guidance some
16 appropriate uses and appropriate uses of removal
17 efficiencies. We have indicated that it would be
18 appropriate to compare removal efficiencies in
19 comparing alternate technologies.
20 So, for instance, if you are removing
21 radionuclides chemically from a waste stream and you
22 have one that could remove, for instance, 80 percent
23 of the cesium and another technology that could remove
24 95 percent of the cesium, we would expect that to be
25 taken into account in the selection of radionuclide

1 removal technologies.

2 We also indicated that would be

3 appropriate to look at removal efficiencies when

4 looking at the impracticality or practicality of

5 additional removal by a selected method.

6 For instance, if you have a tank-cleaning

7 method that removes a certain amount of radionuclides

8 per gallon of waste and, for instance, if you started

9 by removing 1,000 curies per 1,000 gallons of waste,

10 if that removal efficiency drops off to a point where

11 you're now removing 100 curies per 1,000 gallons of

12 waste, that might be an indication that this

13 technology either needs to be optimized or replaced.

14 Again, we wouldn't assume that once that

15 particular technology was no longer effective, that

16 that means you are necessarily done, but it is

17 certainly an indication that you should be looking to

18 either reconfigure that technology. Perhaps there are

19 parameters that can be changed to improve the removal

20 efficiency or perhaps it should be replaced.

21 We have also explicitly indicated that it

22 is not appropriate to use the removal efficiency as

23 the sole evidence that you have removed radionuclides

24 to the maximum extent practicable. Certainly it would

25 be one factor, but essentially it is really the

1 cost-benefit analysis I think that provides a lot of
2 the support for the conclusion as to whether it is
3 practical to keep removing radionuclides.
4 We have also added some clarification in
5 that section. We have expanded the discussion of the
6 disadvantages of attempting to quantify benefits in
7 terms of averting collective dose.
8 We do believe there are a lot of
9 difficulties that would be presented, not the least of
10 which is attempting to predict what the population
11 around a site might be for the next 10,000 years.
12 Certainly that would present a difficulty.
13 We believe there are a lot of
14 disadvantages there. We also believe that we need to
15 be ready to review what DOE gives to us. And so we
16 have looked at that in expressing the disadvantages
17 and what a reviewer would need to be careful of and
18 not say explicitly that we would not need to review a
19 waste determination that used that type of
20 modification of the benefits.
21 That said, DOE has not yet given to us or
22 indicated in any other way that they would expect to
23 give to us a cost-benefit analysis in which they did
24 quantify benefits as aversion of collective dose. So
25 we don't necessarily expect this to be an area of any

1 disagreement.

2 We have added guidance about the
3 appropriate scope of cost-benefit analyses. And this
4 change, largely, was in response to public comments.
5 We had said previously that we believe that the
6 direction that DOE should remove highly radioactive
7 radionuclides to the maximum extent practicable was a
8 fairly broad direction and that the issues that could
9 be considered under the scope of practicality included
10 potential mission impacts on DOE, potential impacts on
11 other parts of their site.

12 And we have expanded the scope somewhat to
13 more explicitly include non-radiological worker
14 hazards, environmental benefits that might be accrued
15 by pursuing more waste removal. Those are the two
16 main areas. We have expanded that guidance slightly.
17 And that, in essence, is in line with what we do for
18 ALARA analyses for decommissioning.

19 So essentially the same types of issues
20 that we would consider in a decommissioning analysis
21 of whether dose is maintained as low as is reasonably
22 achievable, those are the same types of things we
23 would include. However, we still expect that the main
24 benefit is going to be averting public dose and that
25 the main costs are going to be financial costs and the

1 dose to workers who are involved in the process.

2 So those are the things that we had

3 focused on earlier. We have expanded the scope

4 somewhat, but we still expect to maintain the focus on

5 the averting public dose and the cost being financial

6 and worker dose, just as we had earlier.

7 We have also added some examples of

8 selecting which radionuclides are highly radioactive

9 radionuclides, mostly to emphasize that it's not just

10 radionuclides that affect public dose that are

11 important but also those that affect an intruder dose

12 or a worker dose. And this isn't really a change from

13 the previous guidance. It's more of a clarification.

14 And, similarly, we have added some examples to clarify

15 how you would incorporate uncertainties into

16 cost-benefit analyses.

17 Now, the last area of change is

18 monitoring. And this actually was an area in which

19 the guidance changed a fair amount, but I am not going

20 to speak about it at great length because we have

21 recently briefed the Committee, just in July, on our

22 monitoring plans and recently received a letter from

23 the Committee about the briefing and about our

24 monitoring plans.

25 So I am just going to mention here briefly

1 that our essential philosophy that monitoring provides
2 a way to manage uncertainties that are inherent in any
3 long-term dose prediction, that has not changed and
4 that monitoring is not a substitute for robust
5 demonstration of compliance. And that philosophy has
6 not changed.
7 The essential change in that section of
8 the guidance is that we have added additional detail.
9 And the main areas that we have added detail in are we
10 have given examples of types of monitoring activities
11 that are related to each performance objective, we
12 have explained more about what we expect from our
13 interactions with DOE and the affected states, and we
14 have talked more about how we are going to document
15 our monitoring results; for example, with reports for
16 each on-site visit, and annual reports.
17 And, again, our monitoring remains
18 risk-informed and performance-based in that we focus
19 on the most risk-significant aspects that we have
20 identified in the technical evaluation report and that
21 they are performance-based in the sense that the plans
22 describe what information we would need, but they are
23 not prescriptive in exactly how DOE would have to get
24 that information.
25 With that, I am going to turn it over to

1 Karen. Karen is going to talk about risk
2 classification.
3 DR. PINKSTON: My name is Karen Pinkston.
4 I am going to be talking about waste classification
5 and new concentration averaging guidance. Dr. Esh was
6 the primary author for the new concentration averaging
7 guidance.
8 The reason that waste classification is
9 important for incidental waste is that the NDAA
10 requires additional concentration if the waste does
11 not meet the part 61 class C concentration limits.
12 It is not completely straightforward to
13 determine the class of incidental waste because the
14 part 61 concentration limits were derived based on
15 many assumptions that may not apply to incidental
16 waste. For example, the part 61 analysis was based on
17 an intruder construction scenario in which the
18 foundation for a house was assumed to be excavated
19 into the waste. This scenario assumed a particular
20 geometry and a particular dilution of the waste with
21 clean soil that was also exhumed when the waste was
22 exhumed and spread around.
23 There is also some credit taken for the
24 dilution of the waste that is at class C concentration
25 limits with waste that is at lower concentration

limits. So the whole waste stream into the low-level waste landfill was not assumed to be all at class C limits.

Finally, there was an assumption about the presence of an intruder barrier cover in the part 61 analysis. In order for the intruder dose for an intruder that intrudes into a low-level waste facility to be less than 500 millirem, all of those assumptions have to be true.

Part 61 also allows for the use of concentration averaging in waste classification. The goal in generating concentration average guidance for WIR is to be consistent with the principles and the branch technical position will also allow inflexibility to account for differences between incidental waste and low-level waste disposal.

In the NUREG, we have three different methods for doing concentration averaging. The first two methods are in the original guidance. And the third method is new.

The first category is physical homogeneity. In this category, waste is mixed with stabilizing materials and results in a product that is homogeneous. An example of something that would fall in this category is saltstone. And in this approach,

1 the concentration is averaged over the total amount of
2 waste and the total amount of stabilizing materials.
3 The second approach is stabilization to
4 satisfy 61.56. And in this case, the waste is
5 stabilized in place. And the concentration is
6 averaged over the amount of material needed to
7 stabilize the waste. In this approach, the
8 concentration of the stabilized waste must approach
9 uniformity in the context of the intruder scenario.
10 And, finally, our new concentration
11 averaging approach is a site-specific averaging
12 approach. And this type of approach was recommended
13 to us in the ACNW comment letter. This approach is a
14 more risk-informed approach that allows you to take
15 into account the specific characteristics of the waste
16 disposal site and the methods of disposal and allows
17 you to take into account differences between the
18 scenarios used for a low-level waste landfill and
19 incidental waste.
20 Now, this picture depicts the part 61
21 intruder construction scenario that was used to
22 develop the concentration limits as well as a scenario
23 that would be appropriate to incidental waste.
24 And, as I mentioned earlier, the part 61
25 analysis considered multiple scenarios in the

1 analysis, but the limiting one that was ultimately
2 used to develop the concentration limits was a
3 intruder construction scenario. In this scenario,
4 clean soil as well as waste was exhumed when building
5 the foundation for a house.
6 Some major differences exist between that
7 scenario and scenarios that are appropriate for
8 incidental waste. One main difference is the physical
9 configuration of the waste and the accessibility.
10 A variety of different configurations
11 exist for incidental waste. For example, you might
12 have a tank with a very thin layer of waste at a deep
13 depth. There also might be some ancillary equipment
14 and piping that has waste at a level much closer to
15 the surface. And there are also things like
16 saltstone, where there is a large volume of a
17 lower-concentration waste.
18 And a different amount of dilution is
19 expected for each of these scenarios when exhuming the
20 waste. And this level of dilution would likely be
21 different than the amount that was exhumed in the part
22 61 analysis.
23 A new site-specific averaging approach
24 also can take into account site-specific parameters,
25 where the part 61 analysis used generic parameters.

1 The original analysis for part 61 was also based on
2 deterministic analysis, where a new analysis could be
3 done, either deterministically or stochastically.
4 And, finally, the dosimetry used in the
5 part 61 analysis was the ICRP 2 dosimetry. And it is
6 expected that site-specific analysis would use newer
7 dosimetry.
8 The category 3 approach represents a
9 conversion from the snow depicted on the left side of
10 the picture for the part 61 analysis to the one on the
11 right side and uses a risk-informed approach to take
12 into account the depth of the waste, the presence or
13 absence of intruder barriers, current dosimetry, and
14 the propagation of uncertainty into concentration
15 events.
16 Waste classification system is designed to
17 establish a protected upper limit to the concentration
18 of material that may just be suitable for a
19 near-surface disposal. And the use of reasonable
20 conservative scenarios for waste classification
21 ensures that the waste is described in a proper risk
22 context and that classification calculations are
23 reviewed within an appropriate level of effort.
24 This table on this slide shows the
25 scenarios that should be used for the category 3

1 site-specific averaging. The type of scenario that
2 should be used depends on the depth of the waste,
3 whether or not it's shallow or deeper than five
4 meters, and the presence or absence of a robust
5 intruder barrier.
6 A robust intruder barrier is assumed to
7 delay intrusion of the waste by 500 years. And the
8 management of intruder risk by a complex intruder
9 barrier that would prevent access to the waste by more
10 than 500 years is not likely to be practical.
11 The residential construction scenario is
12 appropriate for shallow waste. And this scenario
13 would be a scenario similar to the one used in part 61
14 in which the foundation for the house is excavated,
15 waste and clean soil above it is exhumed.
16 For waste that is deeper than five meters,
17 the appropriate scenario would be a well-drilling
18 scenario in which waste is exhumed when a well is
19 drilled to reach water or some other thing below the
20 site.
21 The dose should be calculated for both the
22 acute -- such as acute scenarios, such as a worker who
23 is doing the exhuming of the waste, as well as a
24 chronic scenario, such as a resident that then lives
25 on the land after the waste is exhumed and spread

1 around. And whichever scenario is limiting should be
2 used. If the scenario other than you solicit is
3 likely to exist and is more limiting, that scenario
4 should be used for the waste classification.
5 In the guidance, example averaging
6 expressions were developed for each of the scenarios
7 presented on the previous slide. These averaging
8 expressions allow NRC staff to quickly evaluate the
9 concentration averaging approach used by DOE to
10 determine when site-specific averaging calculations
11 would require additional review effort.
12 The resulting site-specific averaging
13 expressions for incidental waste should be carefully
14 reviewed, even if it is found that it's consistent
15 with these averaging expressions.
16 The averaging expressions were developed
17 assuming generic site and receptor characteristics and
18 were developed using moderately conservative
19 assumptions. For example, one assumption used was
20 that delimiting short-lived and long-lived
21 radionuclides were used in the averaging expressions.
22 And these averaging expressions were then applied to
23 all radionuclides of that type.
24 The averaging expressions in the guidance
25 are not to be used as a basis for site-specific

1 averaging by DOE for waste classification. It is
2 expected that they will develop their own calculations
3 for concentration averaging.
4 One reason for this is that site-specific
5 variability can result in an order of magnitude or
6 more in the range in these example averaging
7 expressions. So site-specific analysis should be
8 done.
9 The goal in developing these averaging
10 expressions was to compare an analysis that's
11 appropriate for incidental waste to the analysis used
12 to develop the part 61 concentration limits. Adapting
13 the waste classification approach from the one use in
14 part 61 to incidental waste is not just as simple as
15 applying a new dilution factor because there are other
16 differences between the two analyses, such as
17 differences in their dosimetry and differences in the
18 treatment of uncertainty.
19 Conceptually the intruder dose is a
20 function of the concentration in the waste, the volume
21 of waste that is exhumed, and a factor that converts
22 the amount of activity to a dose. This conversion
23 factor is a function of the dosimetry used, parameter
24 value selected, uncertainty, and assumptions used in
25 the model, such as the amount of dilution assumed.

By making a ratio of the top equation for the new analysis to the top equation for a part 61 analysis and rearranging, you can generate the equation shown at the bottom of the screen. In this equation, the x divided by v times x for part 61 is equal to an unknown constant.

So to solve for this unknown constant, a probabilistic Goldsim model was developed and was used to calculate the intruder dose for each scenario for unit concentrations of radionuclides, of all the radionuclides present in tables 1 and 2 in part 61.

It was assumed that the class C concentration limits in part 61 correspond to a 500-millirem dose for this use to develop these concentration limits; in other words, for the low-level waste facility in which the waste is exhumed during a construction scenario.

The equation shown at the bottom of this slide is the same as the equation shown at the bottom of the previous slide but has been rearranged algebraically in order to solve for the unknown constant for each radionuclide.

The values of the concentration for the part 61 analysis are equal to the values in the tables in part 61. And the dose from the part 61 analysis

1 was assumed to be 500 millirem.

2 The value for the dose from the Goldsim

3 analysis was just the output from the Goldsim

4 analysis. And the values for the concentration using

5 Goldsim and volume using Goldsim were to adjust the

6 input values using the Goldsim model.

7 Once the value of this constant for each

8 scenario was calculated for each radionuclide, the

9 constant was plugged into the equation to develop the

10 averaging expressions. And, as I said earlier, the

11 limiting constant was used for each scenario for each

12 type of radionuclide.

13 In other words, all the long-lived

14 radionuclides used the same constant. All of the

15 short-lived radionuclides used the same constant.

16 It would be possible to make a vector of

17 constants for each radionuclide, but for the sake of

18 simplicity in suing these averaging expressions, the

19 conservative assumption was made that the constant

20 from the limiting radionuclide was going to be used

21 and applied to all radionuclides.

22 So conceptually the volume of waste

23 exhumed times this constant can be thought of as a

24 factor that converts the scenario used for the part 61

25 analysis that is appropriate for WIR.

1 So then the radio of this concentration
2 times the concentration in the waste and incidental
3 waste times this factor can be divided by the
4 concentration in part 61 in order to calculate a
5 radionuclide classification factor.
6 And the value of this classification
7 factor needs to be less than one in order for the
8 waste to not be greater than class C. And the
9 fractions approach is used to account for the presence
10 of multiple radionuclides. And some of the
11 radionuclide classification factors for all
12 radionuclides present needs to be less than one.
13 Now I will turn it back over to Anna.
14 MS. BRADFORD: So, in conclusion, the
15 guidance has been revised, taking into account the
16 public comments we received as well as increased staff
17 experience gained from related activities.
18 However, the guidance remains flexible, is
19 still applicable to many different types of reviews
20 while still providing a consistent basis for those
21 reviews and also for different reviewers. And we look
22 forward to continuing to interact with the Committee
23 with respect to waste determination.
24 CHAIRMAN RYAN: Great. Thank you.
25 VICE CHAIRMAN CROFF: Mike, go ahead.

1 CHAIRMAN RYAN: This method that you have
2 just presented is pretty neat. That is some good
3 work. There is a lot of action, isn't there, in that
4 factor X for the specific sites? There is a lot of
5 meat behind that one factor that is larger than to go
6 through that one process and evaluate. That is a real
7 interesting method. Good work.
8 I don't have any other questions. I just
9 think it's real interesting, great follow-up, and
10 thanks for the feedback.
11 VICE CHAIRMAN CROFF: Ruth?
12 MEMBER WEINER: I am very interested in
13 the fact that you have developed a method that has
14 more general application than just WIR. And I just
15 wondered if you tried applying it to anything else
16 greater than class C waste, any other kind of site.
17 MS. BRADFORD: Not as far as we know, no.
18 MEMBER WEINER: No?
19 MS. BRADFORD: It was just put out in this
20 WIR guidance specifically for WIR. And I think we
21 even said in there that this was developed
22 specifically for these types of situations.
23 MEMBER WEINER: Well, it's just
24 interesting because it encompasses a number of general
25 concepts that I think are more widely applicable to

1 that.

2 MS. BRADFORD: Right.

3 MEMBER WEINER: What has been the reaction

4 of your various stakeholders to this method, to your

5 averaging method?

6 MS. BRADFORD: I'll let Karen and

7 Christianne talk about that, but I know that DOE

8 responded pretty positively to it. They understood it

9 a little bit better and understood how to apply it a

10 little bit better, it sounded like. Do you want to

11 add anything to that?

12 DR. RIDGE: All we would want to add is

13 that we did meet -- as Anna mentioned at the beginning

14 of the discussion, we did recently meet with DOE to

15 discuss the guidance. I wasn't actually at that

16 meeting. I heard about it.

17 MS. BRADFORD: It did just come out at the

18 end of August, though. And I'm not sure all of our

19 stakeholders have had a time to digest it. But we

20 haven't yet herd from others about this particular

21 part of the guidance.

22 CHAIRMAN RYAN: Just a quick follow-up.

23 You know, I am sitting here thinking more about your

24 calculational method. You have actually devised a way

25 to take a classification system based on concentration

1 and convert it to a classification system based on a
2 risk assessment.
3 I want to ask you a question that's
4 outside of this box a little bit, but why couldn't you
5 evaluate waste that was even greater than class C
6 because it would be based on a quantity and a quantity
7 at risk, rather than the concentration in the waste
8 itself?
9 You don't have to answer it not, but just
10 think about that. I mean, you really translated from
11 concentration to risk. That's a big deal. What do
12 you think? Dr. Esh, any thoughts?
13 DR. ESH: Yes. This is Dave Esh.
14 I would hope so. I mean, that was the
15 goal.
16 CHAIRMAN RYAN: It is really neat.
17 DR. ESH: We thought about your input, but
18 obviously we thought about this issue, even before we
19 got your input, --
20 CHAIRMAN RYAN: That's true.
21 DR. ESH: -- because we realized we needed
22 some more flexibility. And so we did the groundwork
23 for that, even before the last draft of the document
24 was out.
25 CHAIRMAN RYAN: Is there any chance you

1 are going to pursue this as a separate activity and
2 just maybe push this method out a little bit more and
3 see what you can do with it?
4 DR. ESH: I don't know. I think it's a
5 good idea to see how it works for some other problems
6 at least. You know, people have really strong views
7 about waste classification and concentrations, et
8 cetera. And we got comments on both ends of the
9 spectrum. In all fairness to them, a lot of the
10 commenters that had opinions, they were all right to
11 some degree.
12 CHAIRMAN RYAN: I hear you, yes.
13 DR. ESH: I think by trying to turn this
14 into more of a risk-informed approach or risk-informed
15 calculation, it allows you to incorporate all of those
16 views.
17 Then you can't get into the -- it's harder
18 to get into the philosophical arguments that you need
19 to. And it's more in a quantitative space, which is
20 where I think it should be.
21 CHAIRMAN RYAN: Yahoo.
22 VICE CHAIRMAN CROFF: Ruth, are you done?
23 MEMBER WEINER: I'm done.
24 CHAIRMAN RYAN: Sorry.
25 VICE CHAIRMAN CROFF: Jim?

1 MEMBER WEINER: No. That's fine.

2 MEMBER CLARKE: Thank you.

3 Could you put up slide 9, please? I just

4 had a couple of questions about one of the topics. I

5 can't recall. Evapotranspiration barriers, were they

6 in your original guidance or does --

7 DR. RIDGE: I don't think we spoke to them

8 explicitly.

9 MEMBER CLARKE: So when it says,

10 "additional review procedures," you have added that

11 topic?

12 DR. RIDGE: Yes, right. There were

13 several specific topics that we added review

14 procedures to address. One of them was

15 evapotranspirative barriers. Specifically what we

16 indicated was that if DOE does propose an

17 evapotranspirative barrier, it is important for us to

18 look at when the precipitation is expected to occur

19 and whether that coincides or not with the season when

20 the plants would be growing.

21 Some of these are relatively short-term

22 concerns. We wouldn't expect an evapotranspirative

23 barrier. We wouldn't give it credit for functioning

24 for 10,000 years. But in the shorter term, some of

25 the -- we didn't have specific guidance about

1 evapotranspirative barriers, but some of the specific
2 guidance we added is that it is important when you
3 look at these to look at when the precipitation is
4 occurring, when the plants are growing because that
5 has a lot to do with how effective the barriers can
6 be.
7 MEMBER CLARKE: Right. The barrier has a
8 component that is intended to store water during the
9 --
10 DR. RIDGE: Exactly, exactly.
11 MEMBER CLARKE: One of the things we have
12 learned with those barriers is don't work with annual
13 averages. You know, you need to work with episodic
14 events. There have been failures because the design
15 didn't do that.
16 Did that come from public comments or was
17 that --
18 DR. RIDGE: It did. That was an issue
19 that was pointed out in public comments. And,
20 actually, the staff had meanwhile done additional
21 research in that area. And so that coincided, the
22 staff learning more about that area, with the public
23 comment we received.
24 MEMBER CLARKE: So if you were looking at
25 a proposal for that barrier, as opposed to another

1 barrier, again, your intent would be to do a
2 performance-based evaluation of that particular
3 engineered cover, would it not be?
4 DR. RIDGE: Yes, although I'm not sure we
5 would be reviewing the selection. Essentially the
6 guidance is geared towards if DOE proposes to use an
7 evapotranspirative barrier and --
8 MEMBER CLARKE: Right, right. These are
9 the things that are important to performance.
10 DR. RIDGE: Right, exactly.
11 MEMBER CLARKE: Okay. Has anyone proposed
12 yet? I was thinking of Idaho.
13 DR. RIDGE: No.
14 MEMBER CLARKE: No? Okay. Slide 15.
15 This is kind of a silly question. I'm going to ask it
16 anyway. When I first looking at your drawing on the
17 right, it looked like the well was going through the
18 tank. That is not the case.
19 DR. PINKSTON: Yes. The well is going
20 through the tank and --
21 MEMBER CLARKE: It is going through the
22 tank?
23 DR. PINKSTON: Right. And so when you
24 exhumed the material, went into the well, you exhumed
25 waste as well as probably grout up in the tank above

1 it and clean soil above and below the tank.

2 MEMBER CLARKE: Say that again. That's

3 not a monitoring well?

4 DR. PINKSTON: No. It's you have a house

5 and you want to get drinking water and you

6 accidentally happen to hit the tank.

7 MEMBER CLARKE: Okay. It's an intruder

8 scenario. Yes. Okay. I am with you. Thank you.

9 VICE CHAIRMAN CROFF: You are monitoring

10 really close to the well.

11 (Laughter.)

12 VICE CHAIRMAN CROFF: Are you done, Jim?

13 MEMBER CLARKE: Yes. Thanks.

14 VICE CHAIRMAN CROFF: Okay.

15 MEMBER HINZE: Following up on Dr.

16 Weiner's comment about the possible generic use of

17 this, the Committee has entertained some thoughts

18 about the use of buffer zones and *in situ* leach mining

19 facilities. And I am wondering if you could expand a

20 bit about your guidance in terms of what the guidance

21 is regarding the use of the buffer and further studies

22 upon a possible violation of the limits at the point

23 of compliance.

24 What do your regulations suggest

25 regarding, what does your guidance suggest regarding,

1 the use of the buffer in the point of compliance?

2 DR. RIDGE: Well, essentially, if I

3 understand your question correctly, once you cross

4 over the buffer zone into the waste site, you are

5 regarded as an inadvertent intruder.

6 And so with respect to the point of

7 compliance, we would expect the member of the public

8 protected by 61.41 to be outside of that buffer zone.

9 And then once you are inside of that buffer zone, the

10 dose limit that applies for compliance is the dose

11 limit for the inadvertent intruder.

12 But I am not sure I understood your

13 question clearly.

14 MEMBER HINZE: So this is strictly for the

15 inadvertent intruder. Is that --

16 DR. RIDGE: Well, it influences the point

17 of compliance for the member of the public who is not

18 intruding because that dose limit applies only outside

19 of the buffer zone. So that person is not on the

20 waste site, and they are outside of the buffer zone.

21 MEMBER HINZE: And the buffer zone is

22 determined by the local groundwater conditions and the

23 geohydrologic conditions?

24 DR. RIDGE: Those certainly are factors.

25 Essentially there is flexibility. Buffer zones should

1 be site-specific in how much space you would need to
2 do to effectively perform monitoring and how much
3 space you would think you would need if you did need
4 to take mitigative measures, what buffer zone you
5 would need for that.
6 In the environmental impact statement for
7 part 61, it actually was envisioned that the buffer
8 zone would be site-specific in that it could even be
9 larger on one side of a site than on another depending
10 on the direction of groundwater flow. And that was
11 actually in the original intent.
12 Now, typically we've often simplified that
13 and said 100 meters around a site, but certainly those
14 factors, the local geology, the local hydrology, we
15 would consider as sensible technical things to
16 consider if they were submitted to us.
17 MEMBER HINZE: And that would also pertain
18 to the monitoring sites as well, I assume? All of
19 those conditions would be entered into, what would be
20 acceptable monitoring?
21 DR. RIDGE: Yes, and the two are related.
22 MEMBER HINZE: Sure.
23 DR. RIDGE: The amount of buffer space you
24 would need is based, in part, on how much space you
25 think you need to implement a monitoring program.

1 MEMBER HINZE: Are there any monitoring
2 wells or any suggestions regarding monitoring outside
3 of the buffer zone?
4 DR. RIDGE: Well, I can speak to Savannah
5 River and less to the other sites. I mean, they do
6 have a site-wide environmental monitoring program.
7 And certainly there are wells that are part of that
8 program that are outside of the specific buffer zones
9 for the incidental waste, the waste determinations
10 that we have looked at.
11 The monitoring wells that we have looked
12 at for saltstone so far, which is the only place we
13 are doing monitoring at Savannah River, are inside or
14 at the boundary of the buffer zone.
15 But the sites do have, I believe all of
16 the sites do have, environmental monitoring programs
17 that include wells that are placed in various places
18 on the site.
19 MEMBER HINZE: Thank you.
20 VICE CHAIRMAN CROFF: Okay. I would like
21 to come back to these averaging equations, which I,
22 too, find very intriguing. Have you exercised these
23 at all to take a typical saltstone vault or
24 hypothetical tank, I mean, representative tank, I
25 guess, and tried to work out what some of these ratios

1 would be?

2 DR. PINKSTON: I've not. Dave, have you?

3 DR. ESH: This is Dave Esh.

4 I looked at some of the sites and
5 information when we were developing it, but the
6 approach was certainly not designed -- it was designed
7 for the specific problems but not the specific result
8 of those problems. So it wasn't made with
9 consideration of where those sites would come out if
10 you apply this approach to them, but it was made
11 considering their geometries, the distributions of
12 waste, and the depth to waste, and when it may be
13 exhumed or exposed.

14 So it's a subtle difference that I am
15 trying to convey to you, but it wasn't engineered to
16 give all DOE sites will be less than class C. It was
17 done to do the correct approach from a conceptual
18 standpoint and a risk standpoint. However the results
19 come out, so be it.

20 VICE CHAIRMAN CROFF: I understand that,
21 but I was wondering if it had been exercised and the
22 kind of result you get. I mean, what would be the
23 difference between -- I don't want to call it an
24 allowable concentration under 61 and this -- what
25 would this new method tell you?

1 DR. ESH: In general it gives you some
2 benefit. If you looked at it from a pure dilution
3 standpoint, you would think the benefit would be huge,
4 especially for most of the incidental waste sources
5 that are buried deeply.
6 If you have a drilling dilution factor
7 compared to an excavation dilution factor, they're a
8 lot different. But the reality is it's not nearly
9 that different because the analysis for part 61, as
10 Karen so greatly stated, had assumptions built into it
11 like not all the waste that goes into a commercial
12 low-level waste facility is going to be at the class
13 C level. It is layered or it is very deeply the
14 selection of the various parameters that went in to
15 the analysis.
16 There are a whole bunch of assumptions
17 specific for a commercial facility that went into that
18 calculation. Some of those cancel out this dilution
19 effect that you might have for this scenario.
20 And that's why I said the stakeholders had
21 a lot of opinions and comments. I think DOE would
22 probably say, "Hey, it's not fair from a scenario
23 perspective for us to effectively be using this
24 scenario that won't apply to us because of where our
25 waste is and how it's distributed."

1 And some of our other stakeholders said,
2 "Hey, the analysis to support part 61 had assumptions
3 built in it that aren't appropriate for these WIR
4 sites."
5 They were both right. So I think it is a
6 benefit that can result in if you have thin layers of
7 concentrated material, which is generally what a lot
8 of these sites have that can result in those being
9 classified as less than class C from a risk
10 perspective, as it should be. But it's not going to
11 allow you if you have a large quantity of waste buried
12 near the surface that is less than three meters from
13 the surface to be classifying that as less than class
14 C when if you used the part 61 approach, it would be
15 greater than class C. That is not going to happen.
16 VICE CHAIRMAN CROFF: Okay. Thanks.
17 Well, I guess it gets the risk-informed award for the
18 day for sure.
19 I would like to generalize that,
20 generalize off of this, and go back to something that
21 you mentioned at the outset, Anna, on the generic
22 issues. They have been mentioned before in previous
23 WIR briefings. In some place, there is a list of
24 them. And I don't recall them all, but concentration
25 averaging I think may be one. And there were a number

1 of others.

2 Many of those are of interest to us. And,
3 in particular, those that have more general
4 implications, as Mike was alluding to, this
5 concentration averaging thing is interesting in its
6 own right in WIR, but we are thinking an awful lot
7 about broader waste classification issues. You know,
8 part 61, low-level waste disposal industry is starting
9 to think about it an awful lot now.

10 And, as your generic issues and work on
11 them goes forward, we would be interested in hearing
12 more about them; in particular, those that may have
13 more general applications and think about that maybe
14 in terms of 61.58, the alternative classification
15 systems, which we have had discussions in other
16 contexts about. And some of these generic issues may
17 well help inform what an alternative classification
18 might look like.

19 So at some point in the future, we would
20 be interested in, I would say, maybe some kind of a
21 general briefing on the generic issues and sort of
22 where they stand and a little bit of thinking about
23 how they might help us in a broader context.

24 MS. BRADFORD: I agree with you that there
25 might be some overlap there with the sort of larger

1 low-level waste issues. And, luckily, the way our
2 branches are set up, the low-level waste, our
3 low-level waste program, is in the same branch as the
4 WIR program. And so there is some synergy there.
5 We realize that those things might be
6 connected, and we are paying attention to that. And
7 if you want a briefing in the future --
8 CHAIRMAN RYAN: One of the things we heard
9 at our briefing from NEI last month was that they're
10 thinking about as one of their many strategic planning
11 questions if they would consider a 61.58 petition for
12 alternate classification.
13 MS. BRADFORD: Right.
14 CHAIRMAN RYAN: So I second everything
15 Allen said and said this is a real interesting and to
16 my view a very insightful way to begin to think about
17 that in a formal and technically sound fashion.
18 So would it be okay if we wrote a letter
19 saying that? I don't know how it would work, but I
20 think it is a very positive step. And it actually is
21 a way to think about a lot of things we have been
22 writing letters to the Commission about. So, you
23 know, I think we want to certainly recognize it as
24 something that needs some further exploration and good
25 work to add to the good work you have already done.

1 MS. BRADFORD: Scott wanted to add
2 something.
3 MR. FLANDERS: Hi. This is Scott
4 Flanders.
5 CHAIRMAN RYAN: For the record, would you
6 tell everybody who you are with, although we all know?
7 MR. FLANDERS: I'm sorry. Scott Flanders,
8 Deputy Director, Division of Waste Management,
9 Environmental Protection.
10 I agree with the comments, Dr. Ryan, you
11 made earlier now in terms of the potential generic
12 applicability of Dr. Esh's work. We have been
13 thinking about that, particularly if you look at the
14 issues that we are dealing with and the low-level
15 waste strategic assessment that we issued.
16 And if you look at the topics that we have
17 there, in looking at those topics and as we move
18 forward, we see some opportunities to explore how we
19 can leverage some of the work that has already been
20 done. So we fully intend to do that. And we will
21 look for opportunities as we work forward on low-level
22 waste strategic assessment, implementation of the
23 various activities that we are going to do in our
24 low-level waste strategic assessment that come and
25 talk about it in a more generic sense as well as we

1 wrap up some of the generic technical issues that come
2 back and fill you in.
3 But we see many opportunities where a lot
4 of this work, as Anna mentioned the fact that the
5 groups -- it's the same groups working on the issues
6 and the opportunity for the integration.
7 But no, we did not miss the importance of
8 being and the potential to be able to apply this into
9 some of the low-level waste issues we see as we move
10 forward.
11 CHAIRMAN RYAN: Great. Thanks.
12 MR. FLANDERS: Thank you.
13 VICE CHAIRMAN CROFF: Staff? Anybody
14 else?
15 (No response.)
16 VICE CHAIRMAN CROFF: With that, thank you
17 very much for a great presentation. It was very
18 interesting.
19 CHAIRMAN RYAN: Yes. It was great.
20 MS. BRADFORD: Thank you.
21 VICE CHAIRMAN CROFF: I look for something
22 a little bit drier in comment resolution, but this had
23 a couple of pearls in here.
24 CHAIRMAN RYAN: I said it before, but I
25 will say it again. This is one of the most talented

1 performance assessment teams I have ever seen put in
2 one place. So congratulations again.
3 VICE CHAIRMAN CROFF: Now they are going
4 to want a salary increase.
5 (Laughter.)
6 VICE CHAIRMAN CROFF: Okay. With that, I
7 guess 15 minutes, Mike?
8 CHAIRMAN RYAN: Yes. We will take a
9 15-minute break. We will resume at 2:20.
10 (Whereupon, the foregoing matter went off
11 the record at 2:07 p.m.)
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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on Nuclear Waste & Materials 183rd Meeting

Docket Number: n/a

Location: Rockville, MD

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Charles Morrison
Official Reporter
Neal R. Gross & Co., Inc.

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Mallinckrodt, Inc., Downtown St. Louis Site Decommissioning Project

Lydia Chang, Chief, SPB/DWMEP

October 18, 2007

TOPICS

- Mallinckrodt Site History
- Facility Description
- Decommissioning Approach
- Decommissioning Status & Schedule
- Outstanding Issues
- Path Forward
- Questions

Mallinckrodt Site History

- Plant opened in 1867, produced uranium compounds for MED-AEC (1940s-1960s)
- 1942-1958 - extracted U from ore, produced purified U for defense purposes
- 1956-1960 - extracted Cb (also known as Nb), Ta, U, Th, and rare earths for AEC

Mallinckrodt Site History (continued)

- 1956-1977 - produced U & Th salts for AEC
- 1961-1985 - extracted Columbium and Tantalum (C-T) for commercial purpose
- 1987 - shut C-T extraction down
- 1993 - possession-only license for Decontamination & decommissioning
- Currently – produces products for food, cosmetics, and pharmaceuticals

Facility Description

- Facility comprises 43 acres on west bank of Mississippi River
- Facility subdivided into 10 "Plants"
- Former C-T process area – 4.2 acres
- C-T process area – mainly Plant 5, but also parts of Plants 1, 3, 6, 7, 8

Mallinckrodt Downtown St. Louis Site Aerial

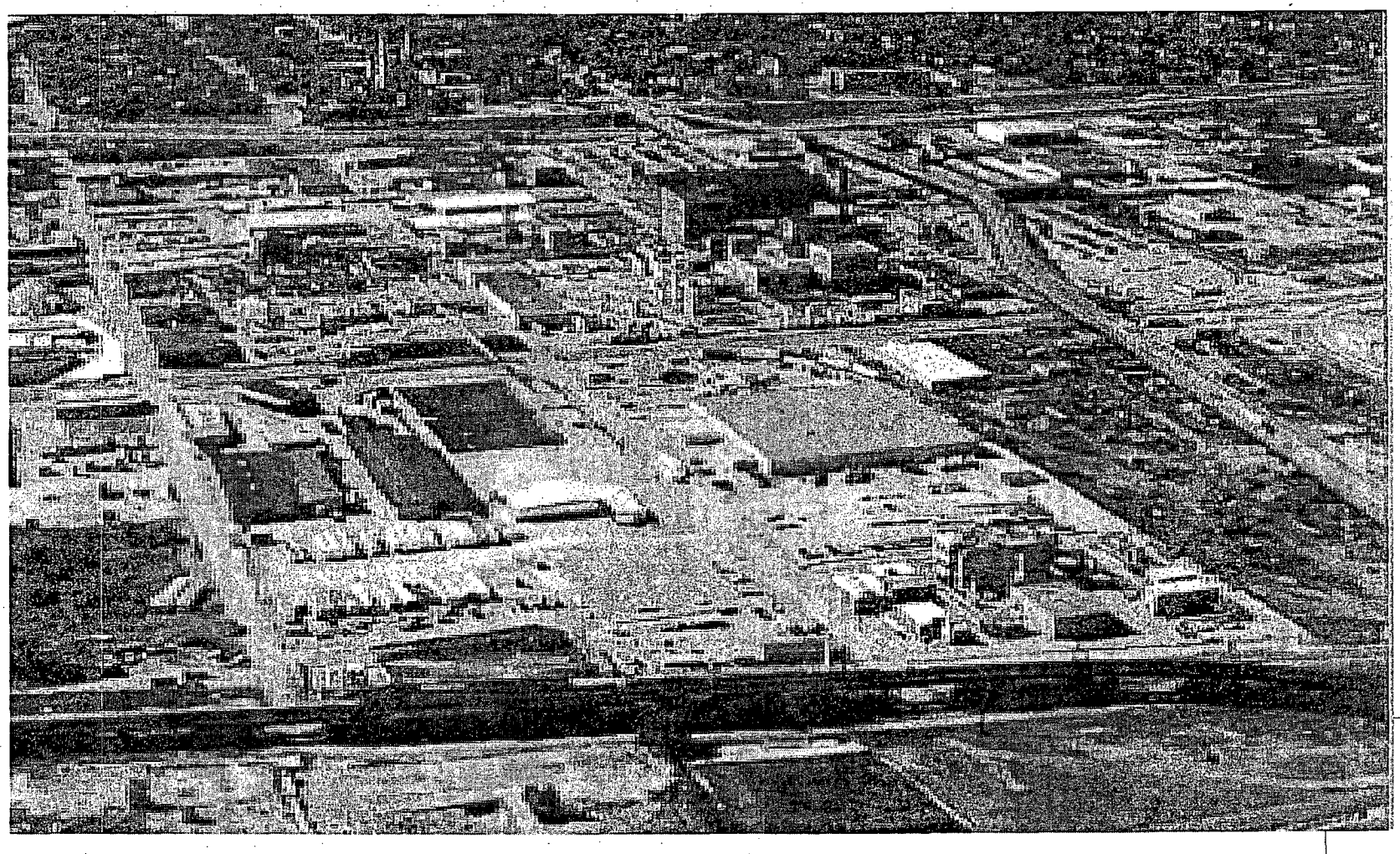
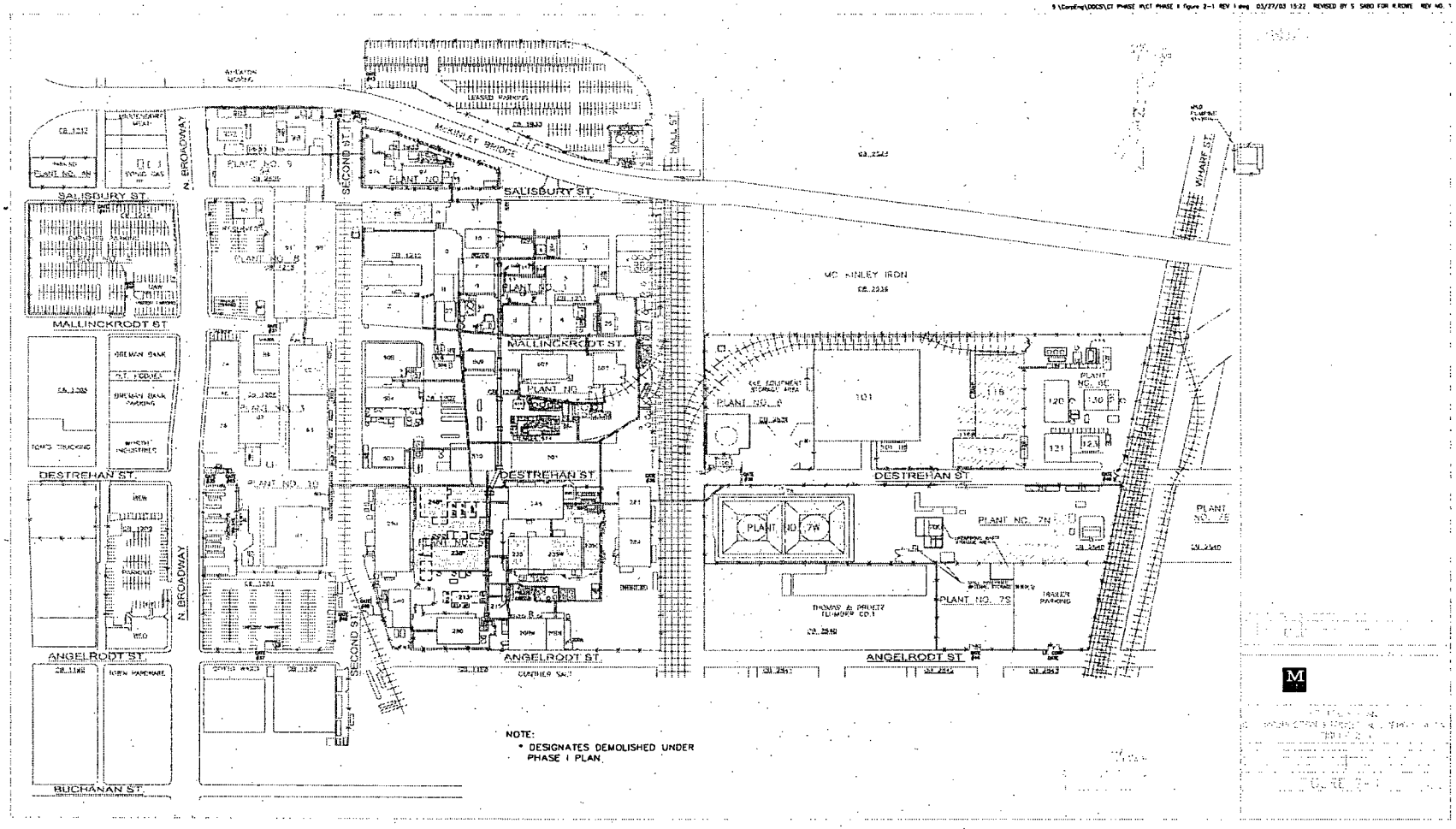


Figure 2-1; C-T Process Area



Decommissioning Approach

- Mallinckrodt to remediate AEC/NRC material
- USACE to remediate MED-AEC material under FUSRAP
- Phased decommissioning project
  - Phase 1 - buildings and equipment
  - Phase 2 - building slabs and foundations, paved surfaces, and all subsurface materials
- Remediate for unrestricted release
- Terminate NRC license

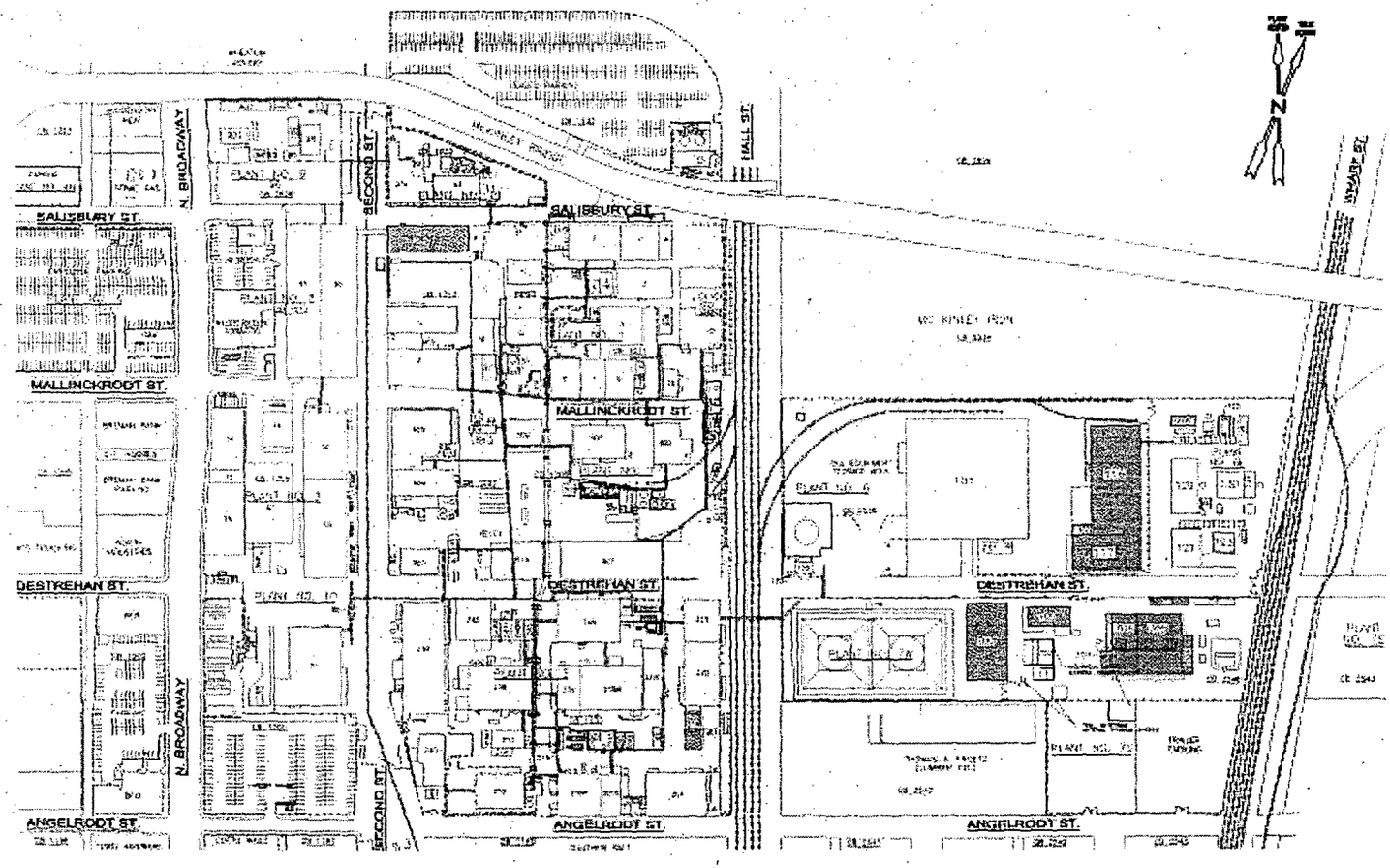
Decommissioning Status & Schedule

- FUSRAP remediation activities
- Phase I
  - remediation began - July 2002
  - completed - February 2005
- Phase II
  - DP submitted – May 2003
  - License amendment request to remove URO in nine trenches in Plant 6W submitted August 2007

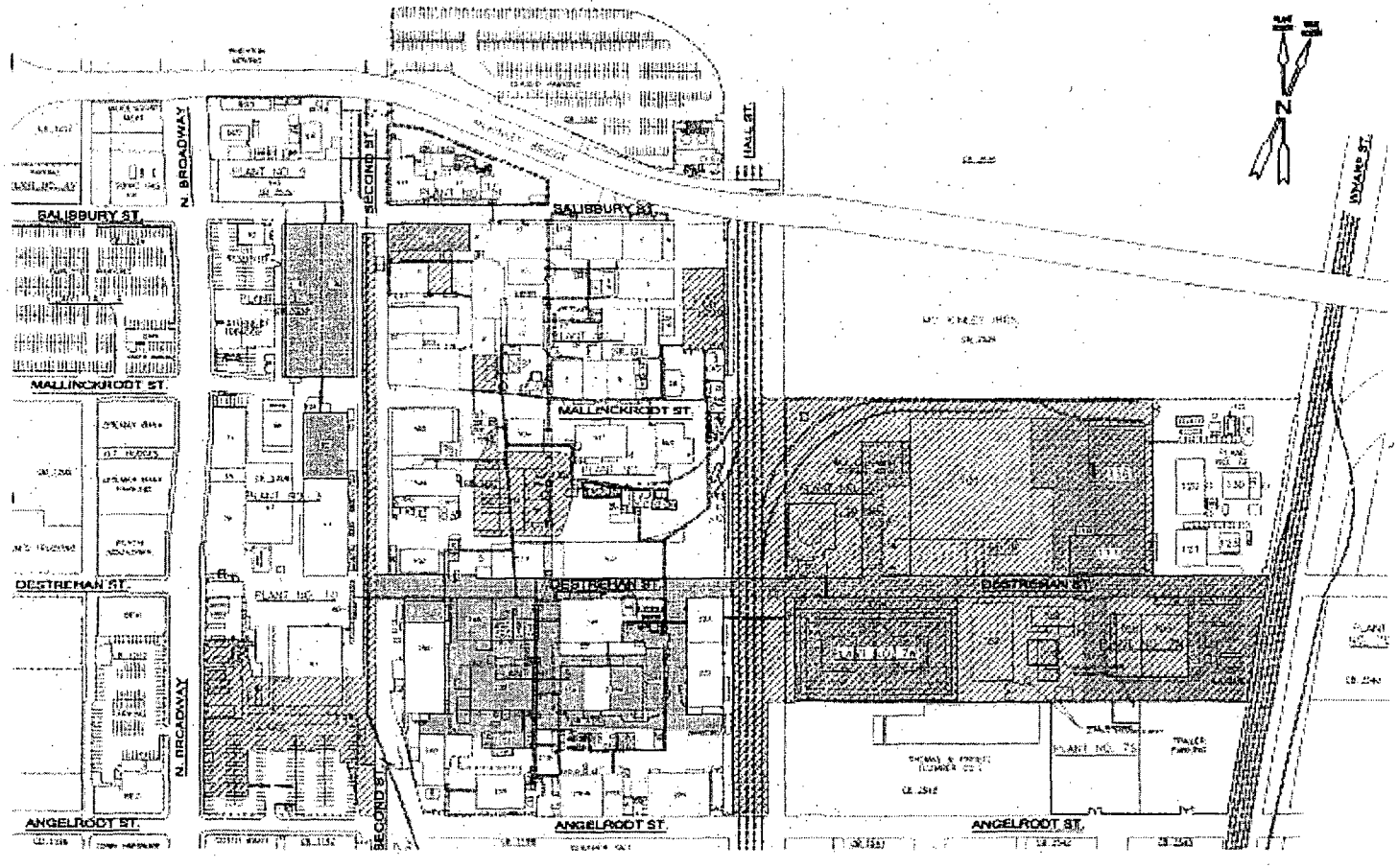
FUSRAP Remediation Activities

- All Plant 6 & 7 buildings used to process uranium demolished by DOE
- Remediation of MED-AEC operation areas under FUSRAP transferred from DOE to USACE in 1997
- USACE soil remediation activities ongoing

FUSRAP Buildings



C-T Production and MED-AEC Operation Areas



C-T Process and Support Buildings

TABLE 2-1
C-T PROCESS AND SUPPORT BUILDINGS

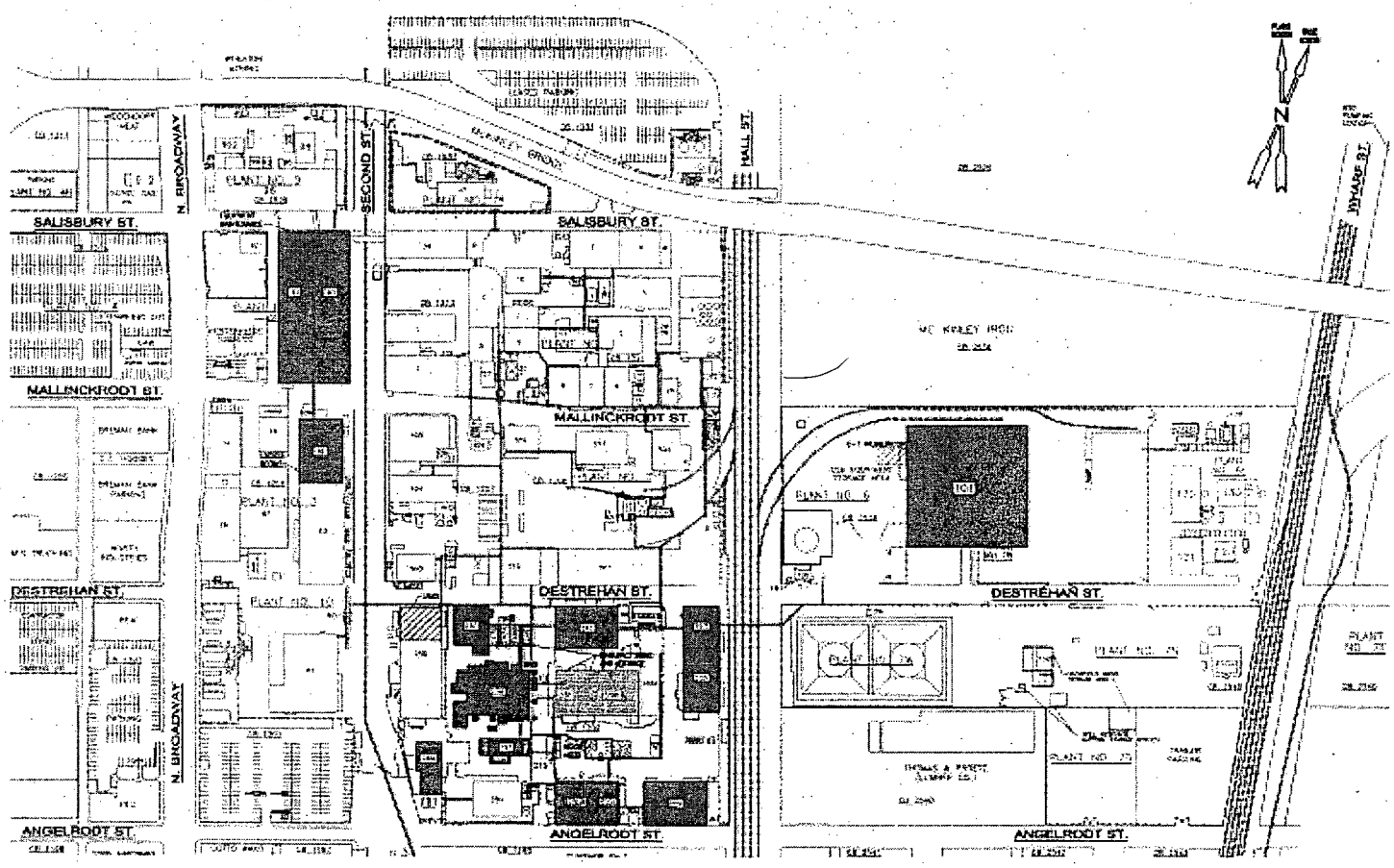
Building No. and Location	C-T Process and Support Areas
Plant 1 Area	
Building 25 (FUSRAP)*	Laboratory
Plant 3 Area	
Building 62	Change Rooms (Lockers)
Plant 5 Area	
Building 213	Change and Break Rooms
Building 214	Transformer/Switchgear Room
Building 235	Feed Material/Storage (East Half)
Building 236	Feed Material Storage
Building 238	C-T Ore Grinding/Dissolving/T Processing
Building 246A	Offices
Building 246B	Solvent Extraction Process
Building 247A	C-T Solvent Extraction/Product Storage
Building 247B	Columbium Filtration and Drying
Building 248	Columbium Filtration/Drying/Calcining
Building 250	Offices and Quality Control Labs
Plant 6 Area	
C-T Incinerator	C-T Incinerator
Building 116 (FUSRAP)	Receipt/Unloading of C-T Ore
Building 117 (FUSRAP)	URO Drum Preparation and Staging
Plant 7 Area	
Building 700 (FUSRAP)	Storage of Tin Slag Feed Material
Building 704 (FUSRAP)	URO Drum Storage
Building 705 (FUSRAP)	C-T Ore Storage
Building 706 (FUSRAP)	C-T Ore Storage
Building 708 (FUSRAP)	Storage of Tin Slag Feed Material
Plant 8 Area	
Building 90/91	Maintenance Areas

* (FUSRAP) These buildings are being addressed under FUSRAP.

Phase 1 Decommissioning

- Phase 1 decommissioning activities included removal of equipment, clean and release of C-T operations buildings, and building demolition

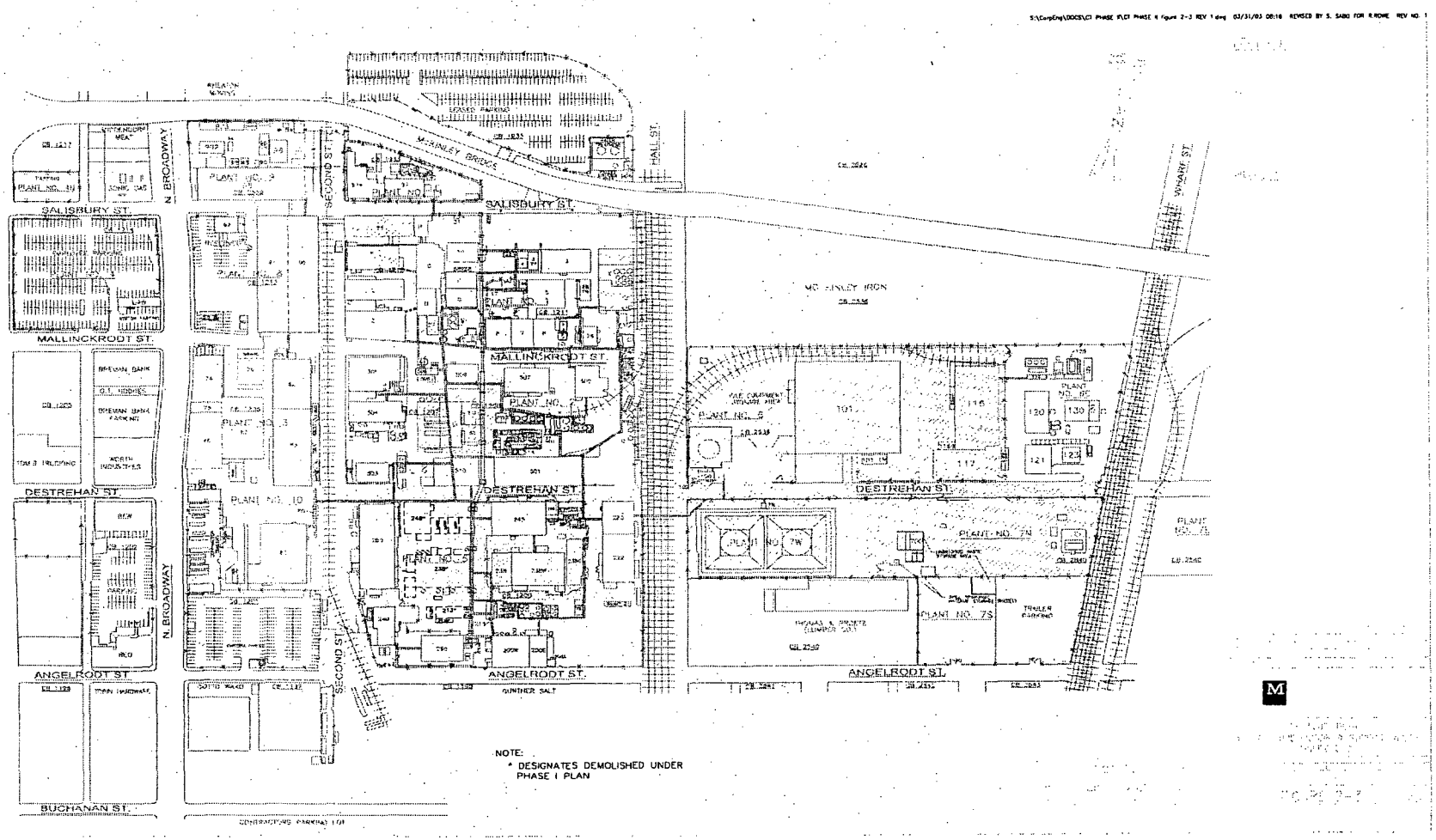
Phase I Demolition



Phase 2 Decommissioning

- During Phase 2 Mallinckrodt will remediate C-T processing building slabs, sewerage, wastewater neutralization basins, and soil affected by C-T processing

Phase II D&D Impacted Areas



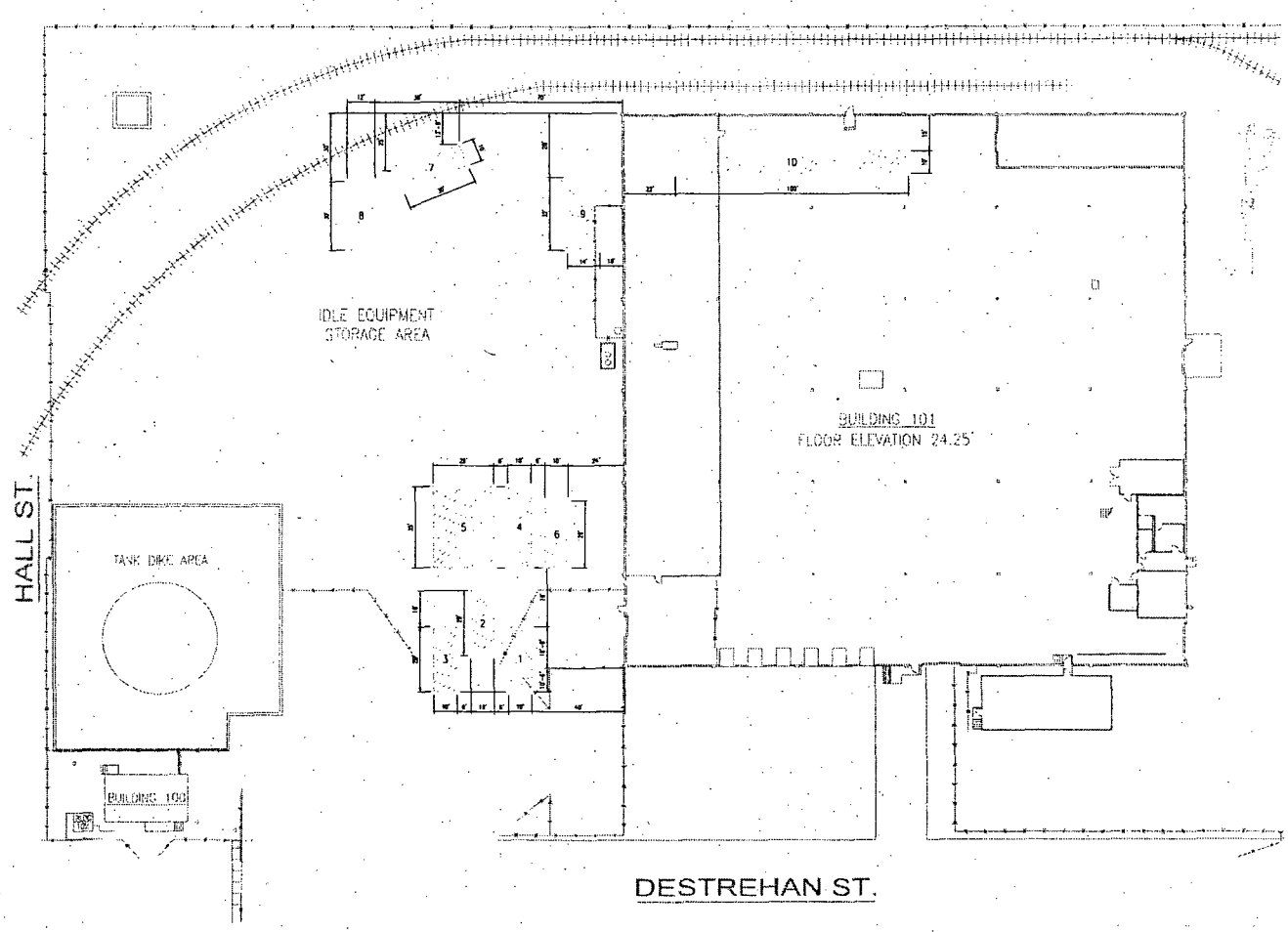
Plant 6W URO Source Removal

- In 1972-73 Mallinckrodt buried URO in Plant 6W trenches in accordance with 10 CFR20.304

- License amendment request to remove & dispose of URO burials in nine trenches

- USACE removes FUSRAP wastes once licensee completes URO removal

Plant 6W Burials



Outstanding Issues

- Delineation issues for Plant 6W soil around trenches
  - Apparent inconsistencies between Agreement and license amendment request
  - Request to withhold Agreement from public disclosure
- Approval of Phase 2 DP
  - Delineation of responsibility for contaminated soil within the facility

Path Forward

- Mallinckrodt and USACE must reach agreement on delineation of responsibility for remaining areas of the facility

- NRC and Mallinckrodt must agree on resolution of outstanding issues to approve Phase 2 DP

- **QUESTIONS**

Holtec Perspective on TADs

Mr. Kristopher Cummings
Manager of DOE Projects
October 18, 2007

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Agenda

- History
- Work performed
- Final TAD Specification
- Holtec Perspectives on TAD Concept
- Holtec Technology to Benefit DOE
- Holtec Users Group (HUG) Perspectives
- Path Forward
- Potential Obstacles
- Conclusions

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History

- November 2006 – DOE Issues TAD Specification.
- December 2006 – Awarded contract with DOE for Design Concept.
- February 2007 – Design Concept Report submitted to DOE.
- March 2007 – Presented Design Concept to DOE
- June 2007 – Final TAD Specification Issued.
- August 24, 2007 – Submitted TAD Proposal.
- Currently awaiting DOE feedback on TAD Proposal.

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Work Performed for Design Concept

- TAD Canister Design (TAD-21 and TAD-44)
- Aging Overpack Design (similar to storage overpacks)
- Transport Overpack Design
- Scoping thermal, criticality, shielding and containment analyses performed to verify design
- Scoping structural analysis including basket stresses, side/end drop analysis and seismic analysis

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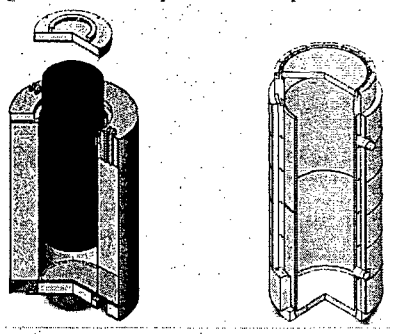
Aging and Transport Overpacks



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Holtec TAD Conceptual Design

- TAD Canister
  - Honeycombed fuel basket providing uninterrupted heat path to canister exterior.
- Aging Overpack
  - METCON™ (metal and concrete) aging overpack
    - Steel weldment with homogeneous concrete
    - No rebar or other sources of crack propagation
- Transport Overpack
  - Layered gamma (steel) and neutron shielding (Holtite™)
  - Top and bottom flanges that connect to the containment boundary.

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Improvements Made to Final Specification

- Variable length of TAD canister allows use of existing HI-STORM cask for storage with no design changes.
- Integral lifting device removable.
- Trunnions on transport cask simplified, in-line with existing transport casks.
- Forced helium dehydration allowed (not just vacuum drying).
- 1ft TAD Canister drop on steel surface.
- Transportation cask has upper fixed trunnions and lower pocket trunnions.
- Added 5" to max diameter of aging cask (presumably to counter the 3g earthquake).

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Additions Made to Final Specification

- Railcar skid design added.
- TAD Waste Package Spacer (TWPS) added.
- Aging cask to withstand 3g earthquake and remain upright.
- More severe fire scenario (1720° F, 30 minutes).

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Holtec Perspectives on TAD Concept

- TAD advantage is standardization of storage/aging/transportation/disposal system.
- TADs do not eliminate the need for dry storage at the nuclear plant sites due to thermal loadings/dose
  - Storage cask loaded at 38 kWatts
  - Transport cask licensed at 22 kWatts (20 years cooling)
  - Aging cask will only be loaded with transportable TADs
  - Waste package requires 11.8 kWatts (30 years cooling)
- Vertical operations for Aging Cask, transfer cask at GROA is simplest operational sequence available.

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Holtec Perspectives on TAD Concept

- To be able to transport higher heatload TADs in a reasonable time frame, canisters **must** be loaded with regionalized loading (hot fuel center, cold fuel exterior).
- Bringing cask designers into product development process will improve cask design and loading process.
- Front loader cask transporter (forklift) not the most economical design.
- Heat load capacity set by basket material – Metamic (metal matrix composite) can hold up well in the repository environment.

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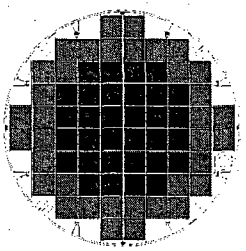
Holtec Perspectives on TAD Concept



Example: MPC-68

- Represents Region 1 (Hot Younger Fuel)
- Represents Region 2 (Cold Older Fuel)

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Holtec Technology to Benefit DOE

- Forced Gas Dehydrator (patented)
- Gamma-Shield Cross Plates for vents (patented)
- Regionalized Loading (Lower dose rates)
- Credit for Thermosiphon effect
- Burnup Credit Methodology Approved (proprietary)
- Currently addressing moderator exclusion and transport of high burnup fuel
- HI-STORM 100U (Underground, patent pending)

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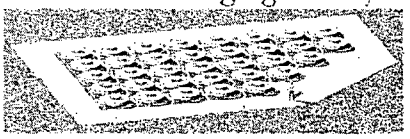
HI-STORM 100U Aging Facility



- Non-existent site boundary dose.
- Virtually zero risk of release of radioactivity from mechanical means (aircraft, missile, etc).
- No damage from environmental phenomena (earthquake, tornado, fire, flood).
- No risk of groundwater intrusion (thick steel container with no penetrations).

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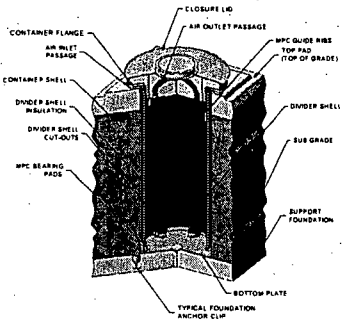
HI-STORM 100U Module



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Benefits of HI-STORM 100U

- No tip-over possible under 3g earthquake since "overpack" is underground.
- No 3" drop from cask transporter.
- 40 mrem/hr dose rate easily met.
- Smaller land area footprint (60% of aboveground systems).
- No handling of a loaded aging overpack (~250 tons).
- All vertical lifts/transfers precludes damage to exterior surface of the TAD Canister during transfer.
- Aircraft impact can only damage 100U lid, no potential to damage TAD canister.
- Simplicity in loading operations at GROA.

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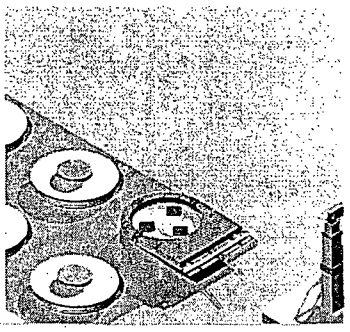
HI-STORM 100U Loading at Aging Facility



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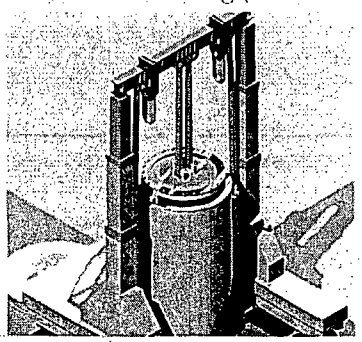
HI-STORM 100U Loading (TAD Transfer)



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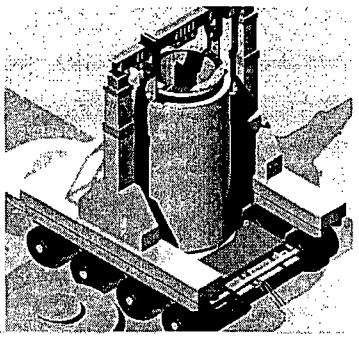
HI-STORM 100U Loading (Remove Transfer Cask)



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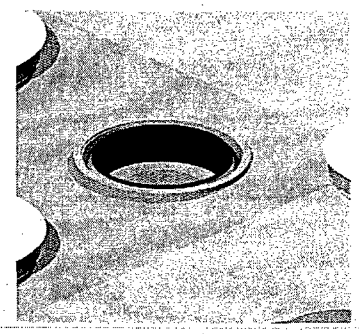
HI-STORM 100U Loading (Lid Installation)



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Holtec Users Group (HUG) Perspectives

- Concept of a "Yucca Mtn Approved" canister is welcomed.
- Lower Capacity is the most significant issue.
  - A larger ISFSI is required (if the land is available)
  - More casks need to be loaded in each campaign (9 versus 6)
  - More time needed to load more casks
  - More casks means more cost.
- TADs will have to be treated as a new cask type (revised procedures, training, engineering evaluations, etc.)
- Utilities have a healthy level of skepticism that TADs will be realized.
- Incentives from DOE will dictate whether TADs are implemented.

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20

Path Forward

- Ultimate goal is to submit to NRC a SAR for transport cask and storage cask separately in December 2008.
- Provide a SAR type document for the Aging Overpack.
- Large amount of work to be done in a short time frame (3 overpacks, 2 canisters) on a very aggressive schedule.
- Licensing timeframe allowed is 2 years for each license submittal (storage and transport).

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Potential Obstacles

- NRC workload for CSNF:
  - Currently 10 storage and 5 transport applications being reviewed. (and many more expected)
  - TADs would involve up to 8 additional complex applications.
- DOE Review time
- Continued start/stop process
- Licensing review of 2 years – if no contentious issues
- Change process
- Material availability (borated stainless steel) and cost
- Political environment

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Conclusions

- DOE needs to provide additional confidence to the TAD concept implementation.
- Changes in the Final Specification will require redesign of the transport and aging overpack.
- Submittal of transport and storage licenses to the NRC by December 2008 is achievable with a speedy review process and smooth project implementation.
- Future modification to the Specification to include underground aging system and higher capacity systems.
- DOE to get cask designers more involved in GROA operations to simplify design and operation of casks.

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Revision of NUREG–1854
NRC Staff Guidance for Activities Related to U.S. Department of Energy Waste Determinations

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October 18, 2007

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Overview

- Background
- Summary of comments
- Performance assessment
- Radionuclide removal
- Monitoring
- Concentration averaging

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Background

- The objective of NUREG-1854 is to ensure consistency of waste determination analyses and monitoring activities, and to facilitate knowledge transfer among NRC staff
- The NUREG was published as a Draft Standard Review Plan for public comment in May 2006
- NRC received 12 comment letters during the comment period and took part in various interactions with key stakeholders during and after the public comment period
- A letter from ACNW regarding the guidance was issued in December 2006
- NUREG-1854 was revised and published in August 2007 as "Draft Final for Interim Use"

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Letters Received

- Four from States (Idaho, New York, Washington, Oregon)
- One from DOE
- One from the West Valley Citizen Task Force
- One from the Natural Resources Defense Council
- Five from private citizens

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Staff Activities

- Between issuance of the May 2006 and the August 2007 version of the guidance, the staff has:
  - Issued the Technical Evaluation Report for Idaho National Laboratory (INL) tank farm (Sept. 2006)
  - Issued and implemented monitoring plans for Saltstone waste at Savannah River Site (SRS) and tanks at INL (since April 2007)
  - Discussed Request for Additional Information for SRS Tanks 18 and 19 with DOE (Spring 2006)
  - Held discussions with DOE regarding technical issues (beginning in Spring 2006)
  - Held two public meetings with DOE (Nov. 2006, Jul. 2007)

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Performance Assessment
Analysis Approach

- Expanded guidance regarding advantages of probabilistic analyses
- Expanded guidance about sensitivity analysis methods for deterministic analyses
  - Emphasized evaluation of conservatism of assumptions (local or global conservatism)
  - Recommended reviewers use independent probabilistic performance assessment to identify risk-significant assumptions

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Performance Assessment
Dose Calculation

- Revision emphasizes that doses should be reported as TEDE to maintain consistency between §61.41, §61.42, and §61.43
- Use of 25 mrem/yr TEDE limit instead of limits based on ICRP 2 is established in the proposed rule for 10 CFR 63
- Revision emphasizes that dose calculations may be based on dosimetry consistent with 10 CFR Part 20 (i.e., ICRP 26/30) or current ICRP dosimetry (e.g., ICRP 72)
- In the two waste determinations reviewed by NRC pursuant to the NDAA, DOE used dose conversion factors consistent with ICRP 26/30 and quantified dose as TEDE

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Performance Assessment
Topics Identified in Previous Reviews

- Grout degradation
  - Expanded guidance related to specific degradation mechanisms
  - Expanded guidance related to modeling uncertainty in degradation effects
- Point of compliance
  - No change in guidance regarding assumptions about institutional controls
  - Size of buffer zone should be consistent with its purpose given in 10 CFR 61.7(a)(2)

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Performance Assessment
Public Comments

- Public comments addressed both procedural and technical topics
- Additional review procedures address
  - Man-made preferential flow pathways
  - Effects of co-contaminants on radionuclide transport
  - Evapotranspirative barriers
  - Anthropogenic climate change
  - Other technical topics

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Radionuclide Removal

Technology Selection and Removal Efficiencies

- Incorporated ACNW&M recommendations about technology selection, including selection of a suite of technologies
- Clarified guidance about use of removal efficiencies
  - Appropriate in comparison of alternate technologies
  - Appropriate in demonstration of impracticality of additional removal by a selected method
  - Not appropriate as sole evidence of removal to the maximum extent practical

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Radionuclide Removal

Cost-Benefit Analyses

- Expanded discussion of disadvantages of quantifying benefits in terms of collective dose averted
- Added guidance about the appropriate scope of cost-benefit analyses, including environmental benefits and non-radiological risks
- Added examples of highly radioactive radionuclide selection and consideration of uncertainty in cost-benefit analyses

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Monitoring

- Monitoring provides a way to manage uncertainties inherent in any long-term dose prediction but is not a substitute for a robust demonstration of compliance
- Revision provides additional detail about
  - Types of monitoring activities related to each performance objective
  - Interactions with DOE and the affected States
  - Documentation of monitoring results
- Specific monitoring plans focus on the most risk-significant aspects of a disposal facility, as identified in the staff's technical evaluation reports. The plans describe information needs but are not prescriptive

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Waste Classification

- The NDAA requires additional consultation if the waste does not meet the Part 61 Class C concentration limits
- The Part 61 concentration limits were derived based on assumptions that may not apply to incidental waste
- 10 CFR 61.55(a)(8) provides for the use of concentration averaging in waste classification

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Concentration Averaging

- Category 1 – Physical Homogeneity
- Category 2 – Stabilization to Satisfy §61.56
- Category 3 – Site Specific Averaging (new)

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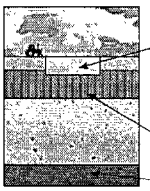
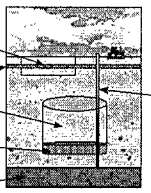
Category 3 – Site Specific Averaging

Part 61 Intruder Construction Scenario



Incidental Waste Intruder Scenario for Tank Residuals or Ancillary Equipment



Deterministic calculations
Dosimetry - ICRP 2
Generic parameter sets
(a)

Probabilistic or deterministic calculations
Dosimetry - ICRP 26 and 30
Site-specific parameter values or distributions
(b)

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Averaging Expression Scenarios

Scenario	Typical Waste Access Time (yr)	Waste Disruption Process	Receptor Type
Shallow waste, no intruder barrier	100	Residential Construction	Construction worker–acute or Resident–chronic
Shallow waste, intruder barrier	500	Residential Construction	Construction worker–acute or Resident–chronic
Deep waste, no intruder barrier	100	Well Drilling	Well driller–acute or Resident–chronic
Deep waste, intruder barrier	500	Well Drilling	Well driller–acute or Resident–chronic

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Example Averaging Equations

- Example averaging expressions were developed for use by NRC staff to determine when site specific calculations may require additional staff review effort
- Conservative assumptions were used in the development of these expressions
- The equations are not to be used as the basis for waste classification

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Example Averaging Equations
Conceptual Approach

- Goal is to develop equations that compare a new analysis for incidental waste to the Part 61 analysis

$$C_{i,j} * V_i * X_{i,j} = D_{i,j}$$

Combining the equations for the Part 61 and new analyses and rearranging gives:

$$\frac{C_{N,j}}{C_{61,j}} * V_N * \frac{X_{N,j}}{V_{61} * X_{61,j}} = \frac{D_{N,j}}{D_{61,j}}$$

where:
- i = the analysis index (either 61 or N)
- j = radionuclide index
- D_{ij} = intruder dose from radionuclide j
- C_{ij} = concentration of radionuclide j
- V_i = volume of waste exhumed
- X_{ij} = conversion factor to convert a source to an intruder dose (function of dosimetry, parameters, uncertainty, assumptions)

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Development of Averaging Equations

- A probabilistic GoldSim model was used to calculate the intruder dose for each scenario for unit concentrations of radionuclides
- The mean dose calculated by GoldSim was used in determining the value of the constant for each radionuclide
- Class C concentration limits in Part 61 were assumed to correspond to a 500 mrem dose for the LLW facility considered in the Part 61 analysis (i.e., $D_{61,j}$=500 mrem)

$$\frac{X_{N,j}}{V_{61} * X_{61,j}} = Constant = \frac{C_{61,j}}{D_{61,j}} * \frac{D_{GoldSim,j}}{C_{GoldSim,j}} * \frac{1}{V_{GoldSim}}$$

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Development of Averaging Equations (cont.)

- The averaging equations were created for each scenario using the constant from the limiting radionuclide

$$\frac{C_{waste,j} * V_{Waste\_exhumed} * Constant}{C_{Part\_61\_tables,j}} = RC_j$$

- The sum of fractions approach is used for multiple radionuclides

$$\sum RC_j \leq 1$$

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Conclusions

- The guidance has been revised, taking into account public comments and increased staff experience
- The guidance is flexible and applicable to many different types of reviews, while providing a consistent review basis
- The staff looks forward to continuing to interact with the ACNW

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