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A Description of Rocky Flats Foundation Drains

Environmental Management
Surface Water Division

Written by : Dean Yashan
Steve Barros
Published by : Lisa Craig

 **EG&G ROCKY FLATS**

Rocky Flats Plant
P.O. Box 464
Golden, CO 80402-0464

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INTRODUCTION

This report is intended to help characterize building foundation drains based on historical information, available drawings, recent surveillance efforts, and discussions with knowledgeable personnel. It is recognized that there is still a need for further surveillance, interviews, and drawing searches to adequately characterize most foundation drains. Further characterization efforts will be pursued as part of a Drain Identification Study (DIS) under the management of Surface Water Division (SWD) personnel, since one of the tasks of this study is to investigate foundation drain discharge locations with the use of dye tests where possible. The DIS will also investigate potential foundation drain contamination sources within buildings. One of the intentions of this report is to provide information that can assist with the Drain Identification Study. This report can also be useful for emergency response assistance and as a source for evaluating potential surface water pollutant pathways.

The purpose of a foundation drain is to intercept and transport groundwater away from the foundation and subsurface structures of a building. A typical foundation drain consists of a trench or series of trenches backfilled with gravel or other free draining material. A slotted or perforated pipe is installed at the bottom of the trench(es). This pipe typically slopes continuously to a storm sewer, sump, or outfall at a lower elevation. In the cases of discharge into a storm sewer or outfall at a lower elevation, gravity transports the water away from the building. Sumps are generally pumped to a discharge location. Attachment 1 is page 189 from Foundation Engineering, Second Edition, by Peck et al. This page shows three common foundation drain designs (referred to as either footing or floor drains).

Foundation drain collection sumps located within buildings are referred to as building sumps in this report since that has been their historical designation. The term 'building sump' has also been used to refer to groundwater discharges which are apparently from utility pits. Building sumps associated with utility pit discharges will not be discussed in this report, although such locations should eventually be fully characterized to ensure that they are not associated with a foundation drain outfall routing.

Most, if not all, underground structures at Rocky Flats currently have, or at one time had, a foundation drain or building sump system. This report elaborates upon any structure for which there is available information pertaining to the existence, or possible existence, of a foundation drain system. Building 776, which has an underground section, may represent the only major building with an underground structure not covered by this report since no foundation drain or building sump information was found for this building.

The foundation drain information will focus on location information, including discharge routing. This information is important for surface water quality monitoring information since foundation drains collect and discharge groundwater. This includes the possibility of groundwater contaminated from historical releases, or from spills within buildings.

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Much of this report is based upon four historical sampling location tables, since many foundation drains and building sumps have been sampled since the late 1970s. The four sampling location tables were either the text of a letter or served as an attachment to a letter. These tables will be referred to as Tables 1, 2, 3, and 4 in this report and are summarized below:

Table 1 (1977): This May 19, 1977, letter from M. V. Werkema to N. E. Moody is a table describing Foundation Drain (FD) and Building Sump (BS) sampling locations. A typographical error referring to FD779-1 as FD771-1 has been corrected.

Table 2 (1981): This table is from a December 17, 1981, report by N. D. Hoffman summarizing FD and BS water quality data for the 1977 through 1981 time period.

Table 3 (1983): This table is from an October 4, 1983, letter from N. D. Hoffman to Those Listed. The letter provides updated information on FD and BS water sampling locations with some additional clarifications. The text of the letter is included as Attachment 2.

Table 4 (1992): This table is from an October 5, 1992, letter from S. Barros to Distribution providing updated information on FD and BS water sampling locations, including plans to expand sampling parameters. The body of this letter is included as Attachment 3.

The 1990 Site Utility Plan Drawings are referenced throughout this report without specific reference to a drawing number. These drawings are all part of the 15501 drawing number series. The Utility Layout Legend Sheet, Drawing Number 15501-2, provides a coding system for identifying which specific Site Utility Plan Drawing one should reference for a specific location on plantsite.

DISCUSSION

Building 111

Figure 1 is a drawing showing several foundation drain outfall locations. Figure 2 is a Building 111 foundation drain plan drawing. Both Figures 1 and 2 show the outfall for the Building 111 foundation drain (FD111-1) in a location north of the northeast corner of the building. This location description is consistent with Table 1 (1977). Recent field inspections of this Table 1 location reveal no potential foundation drain outfalls. Table 2 (1981) describes the foundation drain sampling location as being north of the northwest corner of the building. Table 3 (1983) is consistent with Table 2, as is the sampling location used for the past several years. This sampling location is identified on Figure 2, and has involved taking a sample from within the drainage ditch since a foundation drain discharge location has not been specifically identified.

Recent inspection of the Building 111 basement reveals a building sump which is believed to be a Building 111 foundation drain collection point. This sump is located in the southeast portion of the building. The discharge is pumped through a line that exits through the south end

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of the building where there is both a storm drain and a sanitary sewer line. The discharge line is marked sanitary, although it is believed that the discharge is actually to the storm drain, which happens to flow to the drainage ditch just upstream of the FD111-1 sample location used for the last several years. The FD111-1 sample location is deleted per Attachment 3, and the building sump location is added as BS111-2 to Table 4.

It appears that FD111-1 was rerouted to the new storm drain location or to the sanitary sewer as a result of construction activities in the area. The Site Utility Plan Drawings for Building 111 do not show a Building 111 foundation drain.

There does not appear to be any Individual Hazardous Substance Sites (IHSS's) or historical releases that would contaminate groundwater reaching FD111-1. The basement of Building 111 contains chemicals for photographic development purposes. There are also chemicals and oils associated with the building utilities, which are located in the same room as the BS 111-2 location.

Building 124

Figure 3 is a Building 124 foundation drain plan. This figure shows a Building 124 foundation drain collection point to the east of the building and is consistent with the Figure 1 discharge location for Building 124. The Site Utility Plan Drawing for Building 124 does not show a foundation drain as described by Figures 1 and 3. A foundation drain is not referenced in Tables 1, 2, 3, or 4. A building representative has reported that this foundation drain has been taken out of service.

There does not appear to be any IHSS's or historical releases that would contaminate groundwater reaching the Building 124 foundation drain, if it were still in existence. Building 124 is the drinking water treatment plant and a fuel tank may represent the only threat of contaminating the groundwater in the area around this building.

Building 371/374

Figure 4 shows the foundation drains for the Building 371/374 area, and is consistent with the Site Utility Plan Drawings' depiction of these foundation drains. Tables 1 through 4 lists numerous sample locations associated with the Building 371 foundation drain system, with a lack of consistency between Table 1 (1977) and the remainder of the tables (1981 - 1992). Figure 4 contains circled numbers (1 through 6) referring to foundation drain outfall locations which are consistent with Tables 2 through 4. These circled locations will be referred to as Figure 4 Outfall Locations 1, 2, 3, 4, 5, and 6. The following descriptions for each sampling location ignores Table 1 because of several inconsistencies between Table 1 and all other tables, figures, and attachments. These inconsistencies will be discussed following the descriptions.

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FD371-1: This location no longer exists (reference Attachment 2). The former FD371-1 location described by Attachment 2 (1983) is consistent with the Figure 4 Outfall Location Number 1. Apparently FD371-1 had been sealed or rerouted. Surveillance of the area confirmed no outfall at this location.

FD371-2: The Table 2 and 3 FD371-2 location descriptions are consistent with the Figure 4 Outfall Location Number 2. This location no longer appears to exist (reference Attachment 2), and no alternative FD371-2 sampling location has been identified for several years. Apparently, FD371-2 has been sealed off or rerouted. Building personnel have reported that the FD371-2 discharge now combines with the FD371-3 discharge. Surveillance of the area confirmed no outfalls at this location.

There is a gate valve in the drainage gully southeast of Building 374, at a location down-gradient from the Figure 4 Outfall Location Number 2. This gate has been closed off for several years. It is uncertain whether or not this is an extension of what used to be FD371-2, FD371-1, or both. The gate valve at this location is similar in appearance to FD371-3, and there is water seeping from it at a rate that is too low for sampling, although this water would have contributed to the downstream FD371-Composite sample location discussed below.

FD371-3: The FD371-3 location description is the same for Tables 2, 3, and 4, and matches the Figure 4 Outfall Location Number 3. The consistent flow of water at this location results in a major contribution to the North Walnut Creek baseflow.

FD371-4, 5, and 6: These foundation drain outfalls are actually for the foundation drain system near Buildings 517 and 518, as described by Table 2 and shown by Figure 4 Outfall Location Numbers 4, 5, and 6. These locations are deleted in Table 3 since they could not be found (Reference Attachment 2). These outfalls could not be located during recent surveillance of the area.

FD371-Composite: This location was added to Table 3 (Reference Attachment 2) to compensate for the lack of sampling points for FD371-4,5,and 6. FD371-Composite is deleted from Table 4 (Reference Attachment 3) because of sampling redundancy associated with other sample programs.

FD371-MC: This location is the metal culvert near the sealed gate valve described above under FD371-2. The water source appears to be primarily from a steam condensate line leak. At this time it is not thought to be connected to any part of the Building 371 foundation drain system.

The Table 1 FD371 location descriptions do not match the above descriptions. Per Table 1, FD371-1 appears to be a composite of what is described as FD371-1 and FD371-2 in Table 2. The Table 1 FD371-2 location appears to be what is described above as FD371-3, the Table 1

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FD371-3 location appears to be what is described above as either FD371-5 or FD371-6, and the Table 1 FD371-5 location does not correlate with any locations described above.

The Building 371 foundation drains are located in the vicinity of several IHSS's, and surround a building which contains chemicals, many of which contain significant levels of radioactive materials.

Building 444

The historical information for the Building 444 foundation drain system is confusing. FD444-1 is referred to as the Building 444 foundation drain outfall location in Tables 1, 2, and 3. Building sump BS444-2 is reported to be a groundwater flow collection point which used to route the collected groundwater to the sewage treatment plant based upon experience with the chromic acid spill incident. Groundwater collecting in BS444-2 is now routed to process waste (Reference Attachment 3). The Building 444 foundation drain (FD444-1) location described by Table 3 (1983) is consistent with the Figure 1 (1977) foundation drain outfall labeled for Building 440. This is the only evidence of a Building 440 foundation drain, and could represent an error on Figure 1. Tables 1 (1977) and 2 (1981) describe the FD444-1 outfall location as north of the southwest corner of the building, whereas it is described as south of the southwest corner of the building in Table 3. It is possible that the Tables 1 and 2 use of the word 'north' versus 'south' may be incorrect.

Figure 5 is the Foundation Drain Plan Drawing for Building 444. This figure does not show an outfall routing, possibly because of collection within BS444-2. The question is: "are there, or has there ever been, two foundation drain outfalls associated with Building 444, or is FD444-1 a foundation drain for the basement of Building 447 (Building 447 is attached to Building 444), or is it actually a foundation drain for Building 440 as indicated by Figure 1?" Unfortunately, this report does not answer this question.

There are no references to a Building 447 foundation drain in the documents covered by this report. The Site Utility Plans drawings for Buildings 440, 444, and 447 do not show any foundation drains. The Figure 1 outfall location is shown as a storm drain on the Site Utility Plans drawings. This storm drain runs underneath Building 447, providing a convenient tie-in for a Building 447 foundation drain if one did exist. A recent discussion with a knowledgeable building representative further indicates the possibility of a Building 447 foundation drain based upon his recollections of rerouted piping in the Building 447 basement area.

The FD444-1 outfall location is designated as FD444-460 in Table 4 and Attachment 3 since it also is reported to drain water from the Building 460 foundation drain system. As referenced by the Table 4 description, this outfall has been relocated. The FD444-460 outfall is a major storm drain system outfall for the 400 area. Flow from this location during dry periods may indicate at least one foundation drain discharge to this storm drain, although it could also be caused by

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groundwater seepage into the storm drain system. Tracing this flow by lifting storm drain man-holes could provide additional insight into the origins of this water.

There are several IHSS's in the vicinity of Buildings 444, and 447. Buildings 444 and 447 have been used for the manufacturing of depleted uranium components, and there are various chemicals used within Buildings 444, 447, and 440. Buildings 444 and 447 have flooded a few times over the last several years due to inadequate drainage in the area.

Building 460

The Building 460 foundation drain reportedly ties into the same storm drain discharge system that FD444-1 is reported to tie into (Reference Building 444 above). This outfall location is now described as FD444-460 in Table 4 and Attachment 3. The Site Utility Plan Drawings do not show a foundation drain for Building 460. The Building 460 foundation drain would not be referenced in any of the other tables, figures, and attachments to this report because these items predate the building.

There are a couple IHSS's in the area around Building 460. Building 460 is a manufacturing building with various chemicals in the building.

Building 559

Figure 1 and Tables 1, 2, and 3 do not include any information concerning a foundation drain around or near Building 559 or Building 561, nor are there any building specific foundation drain plan drawings available for these buildings. Figure 6 is a copied section from Site Utility Drawing 15501-20-M, Issue R, showing a foundation drain apparently for the tunnel between Buildings 559 and 561. Per this drawing, the foundation drain discharge routing is from an access manhole to a storm drain system which discharges at a location consistent with the FD516-1 sampling location described in Tables 2 and 3. Table 1, dated May, 1977, does not include FD516-1, although the report that Table 2 is from indicates that sampling had occurred at this location as early as August, 1977.

Inspection of this area has confirmed the access manhole location. It is a deep pit with the sound of water entering it, as might be expected from a foundation drain collection point. Per Attachment 3 and Table 4, the FD516-1 sampling location is moved to this access manhole between Buildings 559 and 561 and renamed as FD 559/561-1 to better reflect this new location. This will result in a more representative foundation drain sample since the current sampling location is subject to dilution from normal runoff, and will alleviate potential problems with collecting a sample since the discharge is pumped into the storm drain meaning that there are periods of no flow.

The foundation drain around the 559/561 tunnel is located in the vicinity of the old process waste system and other IHSS's, and is adjacent to a building containing radioactive materials.

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Building 707

A Building 707 foundation drain is not shown on Figure 1, the Site Utility Plan Drawings, nor on any building specific foundation drain plan drawings. There is a FD707-1 sampling location which is consistent in all tables and attachments to this report. This location is a major storm drain outfall for many of the 700 and 500 area buildings and also is a discharge location for several sumps which pump groundwater out of utility manholes. A utilities representative believes that there may be an old utility drawing showing foundation drains under Building 707 since the building might have been built upon natural springs. The existence of a Building 707 foundation drain is supported by the fact that Building 707 appears to be built on top of what was once part of South Walnut Creek, there is always water flowing at the FD707-1 location, and Building 707 contains several underground structures which would probably be built with a foundation drain surrounding them. A likely discharge location for the foundation drain would be into the storm drain running along the south end of Building 707. This could be investigated by lifting all of the storm drain access manholes to see where the flow enters from. This flow represents a significant contribution to the South Walnut Creek baseflow.

Building 707 is located in the vicinity of the old process waste system and other IHSS's, and contains radioactive materials.

Building 771/776 Tunnel

A foundation drain for the tunnel which runs between Buildings 776 and 771 is not shown on Figure 1 or the Site Utility Plan Drawing for the tunnel, there is no building specific foundation drain plan drawing available, nor is one referenced in Tables 1, 2, 3 or 4. There is a manually operated pump which discharges groundwater to surface drainages through an above ground pipe located to the west of Building 701. According to Building 771 personnel, this pump had been routinely operated to keep groundwater from leaking into the tunnel. The pump has been locked out of service for a few years apparently because of water quality concerns. Recent leakage of groundwater into the tunnel could be because of this lack of discharge.

Research work associated with OU-8 showed that this discharge location is related to another project and is not associated with a foundation drain. It is possible that this is a well that Building 771 personnel pumped down to lower the water table around that tunnel, thus performing a function similar to what a foundation drain would do.

Poor water quality was confirmed by a 1992 sample. Discharges to surface waters or sanitary sewer are thus prohibited by SWD guidelines, making further analysis of this potential foundation drain a relatively low priority from a SWD perspective.

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Building 771

Figure 1 shows three foundation drain outfall routings at the northwest section of Building 771. This figure is consistent with the Figure 7 foundation drain plan drawing for Building 771. These three outfall routings are numbered as 1 through 3 on Figure 7 and are discussed below:

Outfall Number 1: On the 1980 Utility Layout, Outfall Number 1 is shown as a 6 inch corrugated metal pipe draining to the surface at a location just to the east of Building 771. The 1990 Site Utility Plan Drawings show this foundation drain coming from the building, but an outfall routing is not defined. Inspection of the area during a dry period revealed a flow of about one gallon per minute or less coming from the storm culvert going under Sixth Street and exiting south of Building T771F. This could represent drainage from this foundation drain since this is where the water would eventually flow according to the 1980 Utility Layout. This could also represent natural groundwater seepage or a leak in a domestic cold water line that crosses this storm drain.

Outfall Number 2: Both the 1980 and 1990 utility drawings show Outfall Number 2 as a 6 inch vitrified clay pipe with an outfall routing into a storm drain to the northwest. These drawings do not exactly match the Figure 7 routing. It is likely that the Figure 7 sketch has a minor error. Inspection of the area during a dry period revealed a flow of about 1 gallon per minute or less through the referenced storm drain. It is possible that this flow represents Outfall Number 2, or what remains of it.

Outfall Number 3: This outfall was not found on the 1980 or 1990 utility drawings. No flow that can be contributed to this outfall was found during inspection of the area.

Table 1 references only one foundation drain sampling location (FD 771-1). It is unknown which outfall number this location represents, or if it represents a composite of foundation drain outfalls. The two referenced building sumps in Table 1 (BS771-2 and BS 771-3) were deleted from sampling (see Attachment 2) since they were routed to process waste. It is speculated that they collected, or still collect, groundwater within the building. Table 2 references a new foundation drain sample location (FD771-4) which likely correlates to one of the above outfall numbers. Both foundation drain sampling locations are deleted from Table 3 (see Attachment 2). This attachment claims that the foundation drains are non-existent because construction of the Perimeter Security Zone. It is unknown if this means that the drains were removed from service by plugging or other means, or if it means that the sample locations were eliminated. The above referenced inspection results seem to indicate that at least one or two foundation drains are still functioning to some degree. Table 4 includes a sampling location referenced as FD771-1, which is for the flow that appears to be associated with Outfall Number 2 according to the above referenced inspection. This site description should be changed to FD771-5 to avoid confusion with the Table 1 and 2 FD771-1 location description since these seem to be a different sample location based upon the descriptions.

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Building 771 contains chemicals and liquids with significant quantities of radioactive materials. There are also several IHSS's in the vicinity.

Building 774

Figure 8 is a foundation drain plan drawing for the Building 774 foundation drain. This foundation drain is not shown on Figure 1. The Table 1 and 2 FD774-1 sampling location description is presumably for this foundation drain outfall. This location is further clarified in Table 3 and Attachment 2 as being the drain east of the storm drain just east of Building 770. This new description implies that some or all of the previous sampling may have been from the storm drain just east of Building 770. The Table 4 sample location is consistent with Table 3.

Figure 9 is a copied section from the Site Utility Plan Drawing for Building 774. Five outfall locations will be discussed in reference to this figure. These locations will be referred to as Outfall Locations 1 through 5. These locations are labelled on Figure 9. The Site Utility Plan Drawing identifies three foundation drains associated with Building 774. These locations will be referred to as Foundation Drains A through C, and are labelled on Figure 9. The foundation drain system shown by Figure 8 is not shown in the 1980 Utility Plan or the 1990 Site Utility Plan Drawing copied for Figure 9. Figure 8 does not include Foundation Drains A through C presumably because they were installed as part of the post-1975 Building 774 additions. The following is a discussion of the five Figure 9 outfall locations:

Outfall Location 1: This is a metal culvert that was sketched in on Figure 9 since it is not shown on the utility plans. According to Attachment 2 and Table 3, this appears to be the drain just east of Building 770 where sampling is not to take place since it is just a storm drain. Recent inspections reveal a constant flow of water, approximately one gallon per minute, through this drain during dry conditions. It is unknown if this represents water from a foundation drain, from general groundwater seepage into the buried section of the culvert, or is from a leaking water line.

Outfall Location 2: This is the FD774-1 sample location per Tables 3 and 4, and therefore should represent the Figure 8 foundation drain outfall, although there is the possibility that this foundation drain was tied into Foundation Drain A should be considered. There is very minor flow through this metal culvert during dry conditions.

Outfall Location 3: This is the outfall for Foundation Drain A. Revealed through discussions with building personnel, this drain was unintentionally blocked off when an addition was put on the northern part of Building 774, resulting in groundwater leakage into Building 774. This groundwater is collected in a sump and pumped to process waste. It is unknown if the drain is completely blocked or not. No flows were noted during recent inspections.

Outfall Location 4: This is a PVC pipe not shown on the Site Utility Plan Drawing. It is not known if this storm drain, is tied into a foundation drain, or serves another purpose.

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Outfall Location 5: This is the outfall for Foundation Drain B. This outfall has been dry during recent inspections of the area.

No evidence of an outfall for Foundation Drain C has been found at this time. It may tie into one of the other foundation drains.

There are several IHSS's in the vicinity of Building 774. Building 774 treats process waste. Spill threats may be reduced as a result of RCRA containment requirements. All of the above referenced Figure 9 outfalls are believed to flow toward the Interceptor Trench which collects groundwater and surface runoff for eventual treatment as part of Operable Unit 4 operations.

Building 779

Figure 1 shows an outfall location for the Building 779 foundation drain (FD779-1) which is also a storm drain discharge location according to the Site Utility Plan Drawings. Figure 10 is a foundation drain plan drawing for Building 779 showing the foundation drain routing in a direction consistent with Figure 1. Tables 2, 3, and 4 FD779-1 locations are all consistent with Figure 1. None of the Site Utility Plan Drawings for Building 779 and the area around Building 779 show a Building 779 foundation drain.

There is a possibility that this foundation drain has been sealed off or rerouted possibly from construction activities. Even if the existing FD779-1 outfall is correct, a better sampling location would be worth pursuing to avoid mixing of the foundation drain discharge with storm water runoff prior to sampling.

Building 779 is located in the vicinity of the old process waste system and other IHSS's, and contains radioactive materials.

Building 850

This foundation drain is referenced in Tables 3 and 4, but not in Tables 1 and 2 or on Figure 1 since Building 850 did not exist then. Table 3 refers to this location as FD860-1, whereas the name is changed to FD850-1 in Table 4 since it reflects the building that the foundation drain is associated with (reference Attachment 3).

The Site Utility Plan Drawing for this area shows a line running from the building to this discharge location, but does not identify what the function of this line is. There may currently be a project underway to relocate this foundation drain discharge location in relation to Operable Unit 1 activities.

Building 850 is an office building with no IHSS's in the immediate vicinity.

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Building 865

A foundation drain for Building 865 is not shown on Figure 1 or any building specific foundation drain drawings, and there is no reference of a foundation drain in Tables 1, 2, or 3. This foundation drain exists according to a discussion with a utilities representative. Visual surveillance revealed a deep access manhole, located on the east of the building, that appears to be a potential foundation drain collection point. Water was heard draining into the pit. A discharge location was not determined.

The access manhole is shown as an unidentified manhole on the Site Utility Plan Drawing, with the discharge line to the east toward the old steam line system which is shown as being removed from service. Table 4 and Attachment 3 incorporate this new foundation drain information.

Building 865 is considered an IHSS.

Buildings 881/887

Figure 1 shows an outfall location for the Building 881 foundation drain (FD881-1), and Figure 11 is the Foundation Drain Plan Drawing for the foundation drain system around Building 881. This foundation drain also wraps around Building 887 per Figure 11. Figure 1 and 11 are consistent with the foundation system layout shown by the Site Utility Plans Drawing except in the area of Building 887, where the utility plans only show the foundation drain route along the south side of Building 887. According to utility plans the drain discharge routing then turns north to an access location which was verified during recent surveillance of the area, and finally heads in a direction consistent with the Figure 11 discharge routing. The two discharge routes shown by Figure 11 join together before daylighting. This final FD881-1 discharge has recently been routed into a treatment system as part of Operable Unit Number 1 operations.

BS881-2, which is no longer sampled per Attachment 2, is located at the bottom of an elevator shaft. BS 881-3 is no longer sampled per Attachment 2. It is possible that both BS 881-2 and BS881-3 are part of a foundation drain system, and will be further investigated as part of the Drain Identification Study.

Tables 1 and 2 reference a BS887-1. It is unknown if this sump is associated with a foundation drain around Building 887 or if it is still in existence. Sampling at this sump location was stopped per Attachment 2 (1983). This BS887-1 discharge is to process waste according to the 1981 N. D. Hoffman report from which Table 2 is from.

There are several IHSS's in the area of the Building 881 foundation drain system, and Building 881 contains chemicals mostly relating to laboratory activities. Building 887 collects process waste from Building 881.

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Building 883

Figure 1 shows an outfall location for the foundation drain to the west of the southwest corner of Building 883. Figure 12 is a foundation drain plan drawing for this building which shows an outfall routing consistent with Figure 1. This outfall location does not seem to exist anymore possibly because of construction activities in the area. There is an apparent foundation drain collection/access manhole at the southwest corner of the building, which is what a utilities representative claimed it to be. This location is what has been used as sampling location BS883-1 for several years.

The BS883-1 location name has been changed to FD883-1 in Table 4 (reference Attachment 3) since evidence points to the fact that this is the Building 883 exterior foundation drain water being sampled. Surveillance of the area revealed water draining into the pit during a time with no surface runoff, but a discharge location was not determined. The Site Utilities Plan Drawing shows this manhole as part of the storm drain system, and does not reference a foundation drain. In addition to the possibilities of discharge to either the storm drainage or sanitary sewer systems, the possibility that this foundation drain discharges into the Building 881 foundation drain collection system should also be considered.

Building 883 is an IHSS. The foundation drain collection point is near the process waste transport system.

Building 886

The Site Utility Plan Drawing shows a foundation drain for the tunnel which runs between Buildings 886 and 875. This foundation drain is referenced in Table 4 and Attachment 3, but not referenced in any of the other tables, figures, or attachments associated with this report. The Table 4 and Attachment 3 information is based upon the utility drawing, surveillance of the area, and an interview with a utilities representative. There is an access manhole which matches the characteristics of a foundation drain access manhole at the northeast corner of Building 875. During surveillance activities water was noted inside the manhole pit. The discharge location has not yet been determined. There is a seep area along a drainage ditch to the east of this manhole which could be related to this foundation drain discharge.

The Building 886 foundation drain is in the vicinity of an IHSS, and there are liquids contaminated with radioactive materials in Building 886.

Building 910

The foundation drain around Building 910 is not shown on the Site Utility Plan Drawings, Figure 1, or on any available building specific foundation drain plan drawings. This foundation drain is not referenced in any of the pre-1992 tables and attachments. The collection point for this foundation drain is at the northwest corner of the building. Discharge used to be through a

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line running into the nearest solar pond, but had to be discontinued to keep unnecessary flows from this pond. The lack of a discharge from this foundation drain resulted in groundwater leaking into the basement of Building 910. This was resolved by discharging to the surface drainages once the water quality was determined to be acceptable in accordance with SWD incidental water guidelines. Table 4 and Attachment 3 reference this foundation drain and add it to the foundation drain sampling program.

This foundation drain is in the vicinity of the old process waste lines, and near other IHSS's. The basement of Building 910 will be handling large quantities of solar pond and interceptor trench water as part of the Operable Unit 4 (OU-4) remediation efforts.

Buildings 991/998 and the Building 996, 997, and 999 Vaults and Tunnels

The Site Utility Plan Drawings do not show any foundation drains around Building 991 or any of the attaching vaults or tunnels (Buildings 998, 997, 999, and 996). Figure 1 shows two outfall locations for Building 991, one to the northeast of Building 991, and one to the southwest of Building 991. Figures 13 and 14 are drawings showing the foundation drains for Building 991 and for Building 998. These drawings show the Building 998 foundation drain draining into the Building 991 foundation drain (FD991-1) system which discharges toward a location consistent with the Figure 1 discharge to the northeast.

Tables 1 and 2 have identical descriptions for the FD991-1 sampling location to the northeast of Building 991, whereas Table 3 changes the description as clarified in the text of Attachment 2. It is not known if the sample location description changed to reflect where the sampling had always been done, or if the actual sample location was changed, thus necessitating the need to change the location description. This new description is no longer consistent with Figure 1, but could reflect a rerouting of the foundation drain as a result of construction activities in the area. This new Table 3 description for the FD991-1 sampling location could be for a manhole due east of the northeast corner of the building. There are two manholes in this general area. Only one manhole is shown on the Site Utility Plan Drawings, and it is a sanitary sewer manhole.

There is a sump pit in the basement of Building 991 with two pumps routing water into a sanitary sewer line which would feed to one of the manholes described above. During a recent inspection, water was heard flowing into this pit during a dry period, indicating a potential foundation drain collection point. Knowledgeable building personnel confirm this as a probable foundation drain collection point. This location is described as BS991-2 in Attachment 2 and Table 4, with the deletion of FD991-1 from the existing sampling program as described in Attachment 3.

Tables 1 through 4 never address a foundation drain discharge to the southwest of Building 991, and never discuss foundation drains associated with the Building 996, 997, and 999 Vaults and Tunnels. Figure 15 is a foundation drain plan drawing for the Building 996

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foundation drain system which also runs along the tunnel to Buildings 997 and 999. According to this figure, the Building 996 foundation drain system does not tie into the Building 991 foundation drain system, and is instead routed toward a location consistent with the Figure 1 Building 991 foundation drain discharge to the southwest of the building. The status of the Building 996 foundation drain system discharge is unknown and further complicated by construction activities that have occurred over the years in the area of suspected discharge. It is possible that this foundation drain is no longer functional.

The Building 991 and related foundation drains are located in the vicinity of several IHSS's. Building 991 contains chemicals for various processes, and many of the vaults and tunnels store radioactive materials.

Building 995 (Sewage Treatment Plant)

The Site Utility Plan Drawing for the Building 995 area shows three foundation drains associated with the Sewage Treatment Plant (STP). There is no reference to these foundation drains in Figure 1 or in any of the tables or attachments to this report. One of the foundation drains referred to on the Site Utility Plan Drawing is actually a tank drain line which is still in existence but is no longer in use in accordance with Clean Water Act restrictions. The other two foundation drains appear to be located around treatment tanks. Surveillance of the area revealed no evidence of the foundation drain outfalls, and building personnel were not aware of any such foundation drains in existence. These foundation drains were possibly taken out of service as a result of construction activities.

Future Buildings

The following list is of buildings which may have foundation drain systems if the buildings are ever built. This is not necessarily a complete list.

New Health and Safety Building: Current location is west of Building 460.

Centralized Waste Storage Facility: Current location is west of the 904 Pad.

Electrical Rehabilitation Building: Current location is where the 558 transformers are.

Foundation drain outfalls for the above three projects will likely be into nearby storm drainages.

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SUMMARY

There is still much work to be done to positively characterize most foundation drains. A complete review of the Rocky Flats Plant engineering drawings and any Site Utility Plan Drawing updates could be useful. Dye testing may be the only certain way to verify foundation drain outfall locations where there is an access point to add the dye into the system. Efforts should be focused toward foundation drains located where the risk is greatest to surface waters or the sanitary treatment plant.

An updated foundation drain report should be written once a significant amount of additional foundation drain information is available from Drain Identification Study efforts.

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APPENDICES

Including Attachments, Figures, and Tables

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Attachment 1

Drainage, Waterproofing, and Dampproofing

10.7. Drainage, Waterproofing, and Dampproofing

Distress to buildings can often be traced to foundation movements caused by inadequate removal of surface water. Hence, the grading of the site around a building should be carefully designed. If the ground surface next to a building is to be unpaved, its slope should be not less than 1 in./ft.

The nature of the subsoil and the groundwater conditions at a site should always be considered in the choice of elevations for basements and floor levels. If the basement must be established below normal groundwater level, special precautions must be taken to prevent seepage into the structure. Two general methods are in common use: *drainage*, whereby the water is prevented from reaching the exterior of the structure, and *waterproofing*, whereby entrance of the water adjacent to the structure is prevented by some sort of impervious barrier. The two methods are often combined.

Drainage may be suitable where the seep-

age is small enough to permit removal of the water at little expense, usually by gravity flow into sewers or ditches. The most common installations for this purpose are footing drains (Figs. 10.5a and 10.5b), and floor drains, (Fig. 10.5c). The footing drains may consist of short cylindrical sections of clay tile, laid with a gap of about $\frac{1}{4}$ in. between sections and with a strip of roofing felt over the joint to exclude soil. Increasingly they are likely to consist of corrugated perforated metal or plastic pipes because of economy and ease of installation. The drains are laid in trenches backfilled to within about a foot of the ground surface with free-draining material. The upper foot of backfill is preferably of less pervious soil that will prevent inflow of surface waters. Where the presence of water in the drains might reduce the strength of the soil beneath the footings, type *b* is more suitable than type *a*. If the soil being drained is likely to clog the backfill, the backfill material should satisfy the requirements for a filter (Art. 2.5).

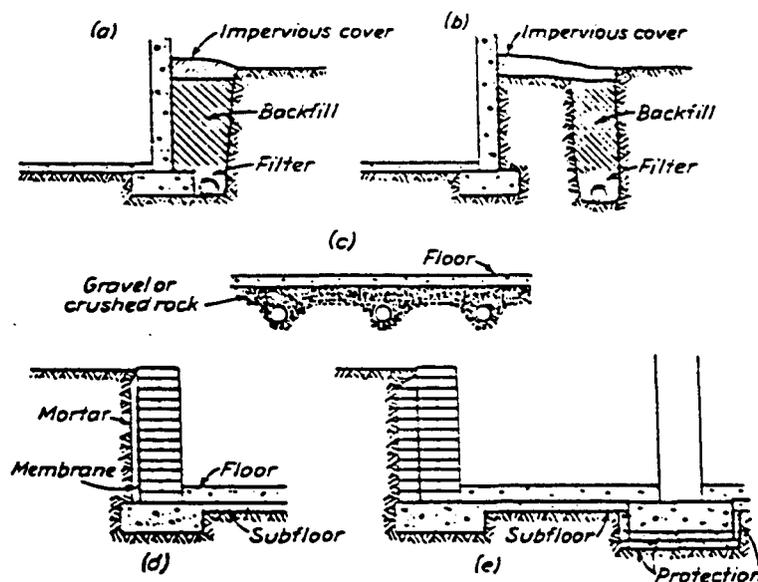


FIGURE 10.5. Methods of draining and waterproofing basements. (a) Footing drain. (b) Intercepting drain. (c) Floor drain. (d) Membrane waterproofing where exterior wall is accessible from outside. (e) Membrane waterproofing where outside of wall is not accessible (after Huntington, 1963).

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Attachment 2

Internal Letter



Rockwell International

Date .October 4, 1983

No. .

TO (Name, Organization, Internal Address)
.Those Listed

FROM (Name, Organization, Internal Address, Phone)
. N. D. Hoffman
. Environmental Analysis
. Building 452
. 4158

Subject LOCATIONS OF FOUNDATION DRAINS AND BUILDING SUMPS - UPDATE

On September 13, 1983, C. T. Illsley and myself checked all the locations of the foundation drains. Attached is an updated list of the foundation drains and a description of their locations. The last list documenting the foundation drain and building sump locations was a letter from N. E. Moody to M. V. Werkema dated May 27, 1977.

The following foundation drains have been deleted or changed:

Foundation drain FD371-1 was abandoned in place (DWG.25022-004). Foundation drains FD371-4, FD371-5, and FD371-6 cannot be located. It is being recommended the sample be taken at the creek between the 517/518 substation and the road to 771. This will be called FD371 composite.

Foundation drain FD444-1 is due south of where it is currently being sampled. The actual location is along the road to Pond C-1.

Foundation drain FD516-1 is actually slightly south and west of the existing sampling location.

Foundation Drain FD774-1 is the eastern most drain from Building 770 and this is where the sample should be collected. The drain just east of Building 770 is a storm drain.

Foundation drains FD771-1 and FD771-4 are non-existent due to construction of the PSZ. The manhole inside the 771 security fence marked by four yellow posts has been sealed.

Building sumps BS771-2 and BS771-3 have been deleted because these sumps are pumped to process waste. Sampling the sumps also involves a radiation monitor, booties, respirator, and work permit. Also, a pump would have to be permanently installed in BS771-2 in order to pump the water vertically from approximately 6 feet.

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Those Listed
Page 2
October 4, 1983

Building sump BS881-2 was deleted because the sample consists mostly of oil from the elevator and this water is pumped to sanitary waste.

Building sump BS887-1 was deleted because this sample is mostly oil, not water.

Foundation drain FD991-1 is actually inside the fence surrounding Building 991 due east of the northeast corner of the building.

The following foundation drain has been added:

Foundation drain FD860-1 has been added because of the addition of Building 860. The drain is located south of Building 860 approximately 50 feet from the Plant security fence.

N. D. Hoffman

N. D. Hoffman
Environmental Analysis

Enclosure

Distribution
D. L. Bokowski
R. W. Hawes
R. L. Henry
D. D. Hornbacher
✓ C. T. Illsley
M. T. Jameson
EMF

November 2, 1992

Attachment 3



INTEROFFICE CORRESPONDENCE

DATE: October 5, 1992
TO: Distribution
FROM: S. T. Barros, Surface Water Division, Bldg. 080, X8511 
SUBJECT: FOOTING DRAINS AND BUILDING SUMPS - STB-013-92

INTRODUCTION:

The spill of radioactive water that occurred in Building 371 over the Memorial Day holiday (May 23, 1992, to May 25, 1992) has raised several concerns within the Surface Water Division about the Footing Drains (drains) and Building Sumps (sumps). Although the spill did not reach the Rocky Flats Plant (RFP) outside environment because of containment within the building, concerns were expressed over potential pathways that contaminated water might take through a drain or sump. Other concerns were identification and location of each drain or sump and whether effluent from the drains and sumps will meet the water quality standards that may be imposed on RFP waters by the Water Quality Control Commission (WQCC). These concerns were raised because the footing drains were originally designed to carry groundwater away from the buildings and into the storm drain system. Many of the concerns about the building sumps have been created because according to building drawings and knowledgeable people these sumps are part of a foundation drain type of system with water collection points within the basements of plantsite buildings. With the possibility to transport contaminated water from a spill into the environment via a drain or sump (e.g. Bldg. 444 Chromic Acid spill) SWD felt that each drain and sump should be located and identified as soon as possible.

This letter is intended to present current information about the locations and sampling points for each footing drain and building sump, along with an updated sample location list (Attachment 1) and recommends ways to identify drains and sumps that may have been plugged or rerouted. In addition some comparisons are made between the proposed new stream water standards and the current drain and sump sample data, along with an area map of the Rocky Flats Plant site (Attachments 2, 3, 4, and 5).

The last time the footing drains and building sumps were identified was in a 1983 report. Since then the Protected Area (PA) was constructed, along with several new buildings, and the renovation of older ones. With all this new construction the information contained in the 1983 report is invalid. The following list of drains and sumps has been compiled from the 1983 report, current building engineering drawings, and building tours conducted by SWD staff members.

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Page 2

Building 111 (FD 111-1): Upon investigation the foundation drain outfall to Building 111 could not be found according to the 1983 report description of this site and may have been rerouted or plugged due to the recent construction of Buildings 115 and 116. Tours of Building 111 have uncovered a sump located in the southeast corner of the basement and by all indications pumped into a storm drain. This storm drain runs under Central Avenue and possibly empties into the area that the 1983 report says is the current sample location. This sump may be the new outfall to the current Building 111 footing drain. The former FD 111-1 sample site, which is within the referenced storm drain, will not be sampled.

Building 111 (BS 111-2): By all indications this sump may be the new Building 111 footing drain collection point that was found on the tour of Building 111. (see above).

Building 371 (FD 37-2): This drain was capped, removed from service sometime between 1977 and 1983, and should be deleted from the sampling list.

Building 371 (FD 371-3): This drain is still in service and will continue to be sampled.

Building 371 (FD 371 composite): This site was originally sampled because FD 371-4, FD 371-5, and 371-6 were apparently buried and could not be found. However, with historical data from Surface Water sampling locations down gradient of this location and the monitoring by OU6, this location will be deleted from the program.

Building 371 (Metal Culvert): This is a culvert located south of FD 371-2 which has water flowing from it on a continuous basis. This water may be run off from a steam line. To characterize the water at this location, samples for the same parameters as drain and sump locations will be collected. For database purposes this location will be designated FD-371 MC.

Building 444 (FD 444-460): This sampling location according to knowledgeable personnel is actually the outfall for the Building 444 footing drain and the Building 460 footing drain. The two building drains were connected at the time that Building 460 was constructed. This sampling location will remain the same.

Building 444 (BS 444-2): This location is now connected to the process waste system because of the chromic acid spill and will no longer be sampled.

Building 559 (FD 516-1): This location will be moved because the actual footing drain of concern is the Building 559/561 tunnel. The current location as described in the 1983 report is down gradient of the actual sump collection point. SWD will move the sampling location so that a more representative sample of the footing drain can be collected.

Building 559 (FD 559-561): This is the new location for FD 516-1 (see above explanation) and is located east of Building 561 Door 1 and south of Building 559 Door 6.

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Building 707 (FD 707-1): This location is being sampled on a weekly basis as 750 culvert and will be sampled one more time as FD 707-1, and then dropped from the program as a footing drain. The culvert has been sampled for the same sample parameters as the footing drain with the exception of HSL metals. The HSL metal scan normally collected for the footing drain will now be collected as 750 Culvert Quarterly.

Building 707 (BS 707-2): According to current information the sump is still in service, the sampling point will stay the same.

Building 707 (BS 707-3): This site will need to be further investigated to find out if the process waste system has been changed in this area, and until this determination is made this site will not be sampled. This location has historically had water in it, but within the last year no water has been seen in the manhole.

Building 774 (FD 774-1): According to current information this drain is still in service, the sampling location will remain the same.

FD 779-1: According to current information the drain is still in service, the sampling location will remain the same.

Building 865 (BS 865-1): According to current information the sump is still in service, the sampling location will remain the same.

Building 881 (FD 881-1): This location does not exist any more because of the installation of the French Drain on the 881 hillside. The water from this drain is now being pumped into the OU 1 treatment facility and does not require sampling under this program.

Building 881 (BS 881-3): This location will no longer be sampled because of access problems within the building to the area of the sump. It is possible that this water is pumped into the footing drain (FD 881-1), which is then pumped into the OU 1 treatment facility. This issue needs to be further investigated for confirmation that this situation is in fact true.

Building 883 (BS 883-1): According to current information this drain is still in service, the sampling location will remain the same. However, this will be renamed FD 883-1 during the fourth quarter sampling event, since recent investigations indicate this is the Building 883 footing drain.

Building 991 (FD 991-1): According to the 1983 description this footing drain is located in a manhole inside the security fence due east of the northeast corner of Building 991. However, the 1977 description of this drain says that it is located on the outside of the security fence. According to knowledgeable utilities personnel the drain may have been relocated to a sump in the southeast corner of the basement. It should be noted that a rerouting of the footing drain may have occurred when the Protected Area (PA) was constructed in the mid 1980's.

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Page 4

Building 991 (BS 991-2): This is a new location in the southeast corner of the basement of Building 991. According to knowledgeable utilities personnel who have confirmed this is the collection point for the footing drain.

Building 865 (FD 865-2): This is a new location in a manhole outside of Door 1 to Building 865. According to current information this is the collection point for the Building 865 foundation drain.

Building 886 (FD 886-10): This is a new location in a manhole on the northeast corner of Building 875. According to current information this is the collection point for the Building 886/875 tunnel foundation drain.

Building 850 (FD 860-1): This drain is still in service the current information agrees with the 1983 report that this is the footing drain for Building 850. Also according to the 1983 report this drain was designated FD 860-1, however, since 1986 the footing has been referred to as FD 850-1. The outfall of this is marked by vegetation which clogs the flow of water and makes sampling impossible. The vegetation will need to be removed if future sampling is desired. Current OU1 activities may reroute this water to a new sampling location.

Building 910 (FD 910): New location in the manhole at the north side of Building 910. This location has been sampled in the past and has been called Building 910 manhole.

Building 790 (FD 790): This is a new location in the manhole on the southwest corner of Building 790.

FD 771-1 : This is a new location according to the current information indicates this is the outfall to Building 771 footing drain. The sampling location is southwest of the old 776 guard post. At the next footing drain sampling event this site will need to be evaluated to make sure the metal grate covering the sample collection point can be removed for sample collection.

RECOMMENDATIONS:

Most of the footing drain and building sump outfalls have been located and several have not been located. Dye testing or similar methods may be one way to confirm the exact outfall of these drains and sumps.

July-August 1992, SEMI VOLATILE's and VOLATILE ORGANIC ANALYSES will be collected to characterize each location for volatiles. The collection of the SEMI VOLATILES and VOLATILE ORGANIC ANALYSES was requested by the incidental water group to help determine if further actions may need to be taken with regard to releasing water into the Rocky Flats environment. To accomplish the characterization a minimum of three sampling events will have to be performed to establish a statistical baseline.

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After the statistical baseline has been established for each location it is recommended that eventually some of the sites that do not show a great potential for contaminated water transportation be deleted from the sampling program or have the frequency of sampling changed from quarterly to annually.

Each footing drain and building sump should have a sign placed at the sampling location and each site should be photographed and descriptions collected in book format for future reference. At this time a full day has been spent with plant photography taking pictures of each drain and sump outfall. When these photos are developed they will be correlated with a description of each sampling location.

Attached to this document (Attachment 1) is an updated outfall list of the current footing drains and building sumps, with a brief description of each site. The second attachment (Attachment 2) contains data concerning the footing drains and building sumps from the SWD database. The third attachment (Attachment 3) is a list of water quality standards used at RFP. The fourth attachment (Attachment 4) is a map of the Rocky Flats plantsite.

CONCLUSION:

Comparing the data (Attachment 2) with pH and nitrate results (Attachment 3) indicate they are within water quality limits. The exception to this is BS 707-3, which has had a history of pH exceeding 10. The sump is described as being part of an old process waste drain. The content of the waste may account for the elevated pH. However, all current documentation indicates this sump does not flow into the RFP environment. The data that raises the most concern for meeting water quality standards are the gross alpha, beta, and metals because some drain and sump outfalls are significant contributors to the base flow of plantsite streams. Comparing the water quality standards against the alpha, beta, and metal data indicates that if stream standards were imposed by the WQCC on the drains and sumps that some of these would not meet the standards. The elevated Beta can be attributed to the polar melt, used all over plantsite during the winter months, which has a high potassium content. Sampling some of the FD's and BS's should continue until an in depth review of all the data can be done.

If there are any further questions, contact me at X8511 or D4679.

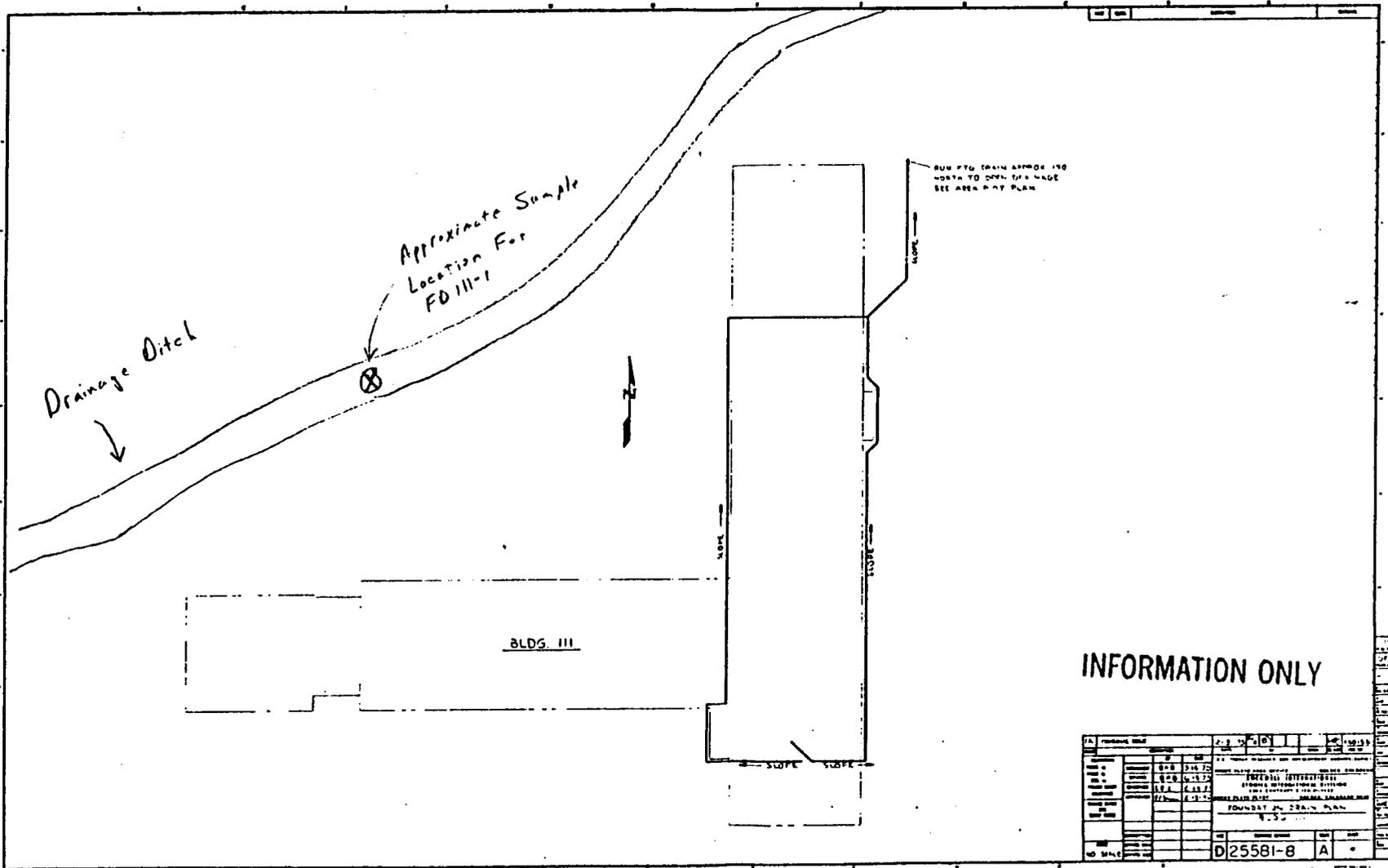
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Attachments:
As Stated

cc:

S.K. Andrews	R.E. Fiehweg	D.R. Wistrand
C. Butz	R.L. Henry	D. Yashan
S.A. Cloud	K.M. Motyl	
L.A. Dunstan	D.S. Murray	

Figure 2: Building 111 Foundation Drain Plan

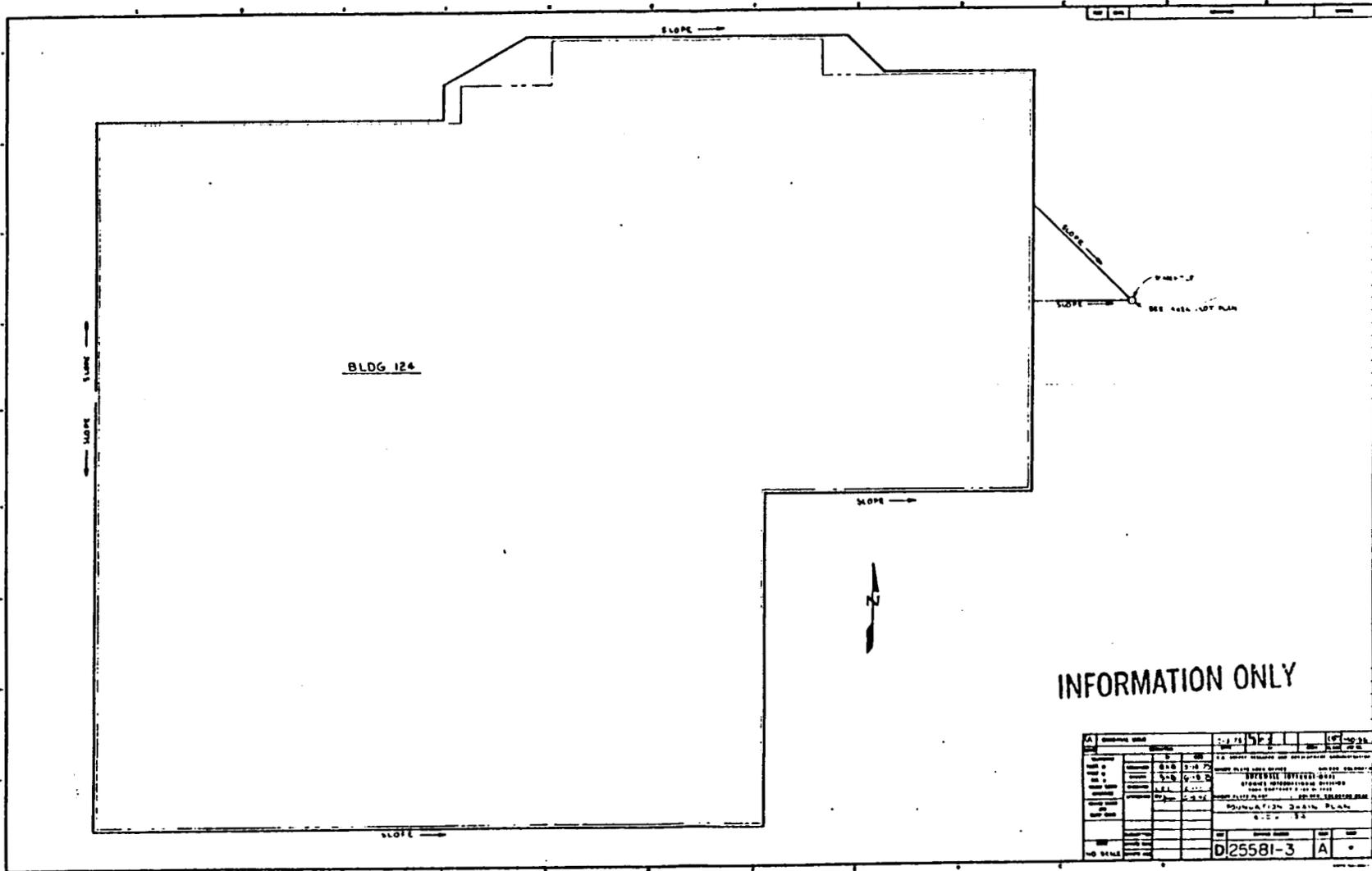


INFORMATION ONLY

NO.	DESCRIPTION	DATE	BY
1	ISSUED FOR REVIEW	11/2/92	...
2	ISSUED FOR APPROVAL	11/2/92	...
3	ISSUED FOR CONSTRUCTION	11/2/92	...
4	ISSUED FOR RECORD	11/2/92	...
5	ISSUED FOR AS-BUILT	11/2/92	...
6	ISSUED FOR FINAL	11/2/92	...
7	ISSUED FOR ARCHIVE	11/2/92	...
8	ISSUED FOR DESTRUCTION	11/2/92	...
9	ISSUED FOR REMEDIATION	11/2/92	...
10	ISSUED FOR DEMOLITION	11/2/92	...
11	ISSUED FOR RECONSTRUCTION	11/2/92	...
12	ISSUED FOR REPAIR	11/2/92	...
13	ISSUED FOR MAINTENANCE	11/2/92	...
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127	ISSUED FOR DESTRUCTION	11/2/92	...
128	ISSUED FOR REMEDIATION	11/2/92	...
129	ISSUED FOR DEMOLITION	11/2/92	...
130	ISSUED FOR RECONSTRUCTION	11/2/92	...
131	ISSUED FOR REPAIR	11/2/92	...
132	ISSUED FOR MAINTENANCE	11/2/92	...
133	ISSUED FOR INSPECTION	11/2/92	...
134	ISSUED FOR TESTING	11/2/92	...
135	ISSUED FOR MONITORING	11/2/92	...
136	ISSUED FOR REPORTING	11/2/92	...
137	ISSUED FOR REVIEW	11/2/92	...
138	ISSUED FOR APPROVAL	11/2/92	...
139	ISSUED FOR CONSTRUCTION	11/2/92	...
140	ISSUED FOR RECORD	11/2/92	...
141	ISSUED FOR AS-BUILT	11/2/92	...
142	ISSUED FOR FINAL	11/2/92	...
143	ISSUED FOR ARCHIVE	11/2/92	...
144	ISSUED FOR DESTRUCTION	11/2/92	...
145	ISSUED FOR REMEDIATION	11/2/92	...
146	ISSUED FOR DEMOLITION	11/2/92	...
147	ISSUED FOR RECONSTRUCTION	11/2/92	...
148	ISSUED FOR REPAIR	11/2/92	...
149	ISSUED FOR MAINTENANCE	11/2/92	...
150	ISSUED FOR INSPECTION	11/2/92	...
151	ISSUED FOR TESTING	11/2/92	...
152	ISSUED FOR MONITORING	11/2/92	...
153	ISSUED FOR REPORTING	11/2/92	...
154	ISSUED FOR REVIEW	11/2/92	...
155	ISSUED FOR APPROVAL	11/2/92	...
156	ISSUED FOR CONSTRUCTION	11/2/92	...
157	ISSUED FOR RECORD	11/2/92	...
158	ISSUED FOR AS-BUILT	11/2/92	...
159	ISSUED FOR FINAL	11/2/92	...
160	ISSUED FOR ARCHIVE	11/2/92	...
161	ISSUED FOR DESTRUCTION	11/2/92	...
162	ISSUED FOR REMEDIATION	11/2/92	...
163	ISSUED FOR DEMOLITION	11/2/92	...
164	ISSUED FOR RECONSTRUCTION	11/2/92	...
165	ISSUED FOR REPAIR	11/2/92	...
166	ISSUED FOR MAINTENANCE	11/2/92	...
167	ISSUED FOR INSPECTION	11/2/92	...
168	ISSUED FOR TESTING	11/2/92	...
169	ISSUED FOR MONITORING	11/2/92	...
170	ISSUED FOR REPORTING	11/2/92	...
171	ISSUED FOR REVIEW	11/2/92	...
172	ISSUED FOR APPROVAL	11/2/92	...
173	ISSUED FOR CONSTRUCTION	11/2/92	...
174	ISSUED FOR RECORD	11/2/92	...
175	ISSUED FOR AS-BUILT	11/2/92	...
176	ISSUED FOR FINAL	11/2/92	...
177	ISSUED FOR ARCHIVE	11/2/92	...
178	ISSUED FOR DESTRUCTION	11/2/92	...
179	ISSUED FOR REMEDIATION	11/2/92	...
180	ISSUED FOR DEMOLITION	11/2/92	...
181	ISSUED FOR RECONSTRUCTION	11/2/92	...
182	ISSUED FOR REPAIR	11/2/92	...
183	ISSUED FOR MAINTENANCE	11/2/92	...
184	ISSUED FOR INSPECTION	11/2/92	...
185	ISSUED FOR TESTING	11/2/92	...
186	ISSUED FOR MONITORING	11/2/92	...
187	ISSUED FOR REPORTING	11/2/92	...
188	ISSUED FOR REVIEW	11/2/92	...
189	ISSUED FOR APPROVAL	11/2/92	...
190	ISSUED FOR CONSTRUCTION	11/2/92	...
191	ISSUED FOR RECORD	11/2/92	...
192	ISSUED FOR AS-BUILT	11/2/92	...
193	ISSUED FOR FINAL	11/2/92	...
194	ISSUED FOR ARCHIVE	11/2/92	...
195	ISSUED FOR DESTRUCTION	11/2/92	...
196	ISSUED FOR REMEDIATION	11/2/92	...
197	ISSUED FOR DEMOLITION	11/2/92	...
198	ISSUED FOR RECONSTRUCTION	11/2/92	...
199	ISSUED FOR REPAIR	11/2/92	...
200	ISSUED FOR MAINTENANCE	11/2/92	...

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Figure 3: Building 124 Foundation Drain Plan

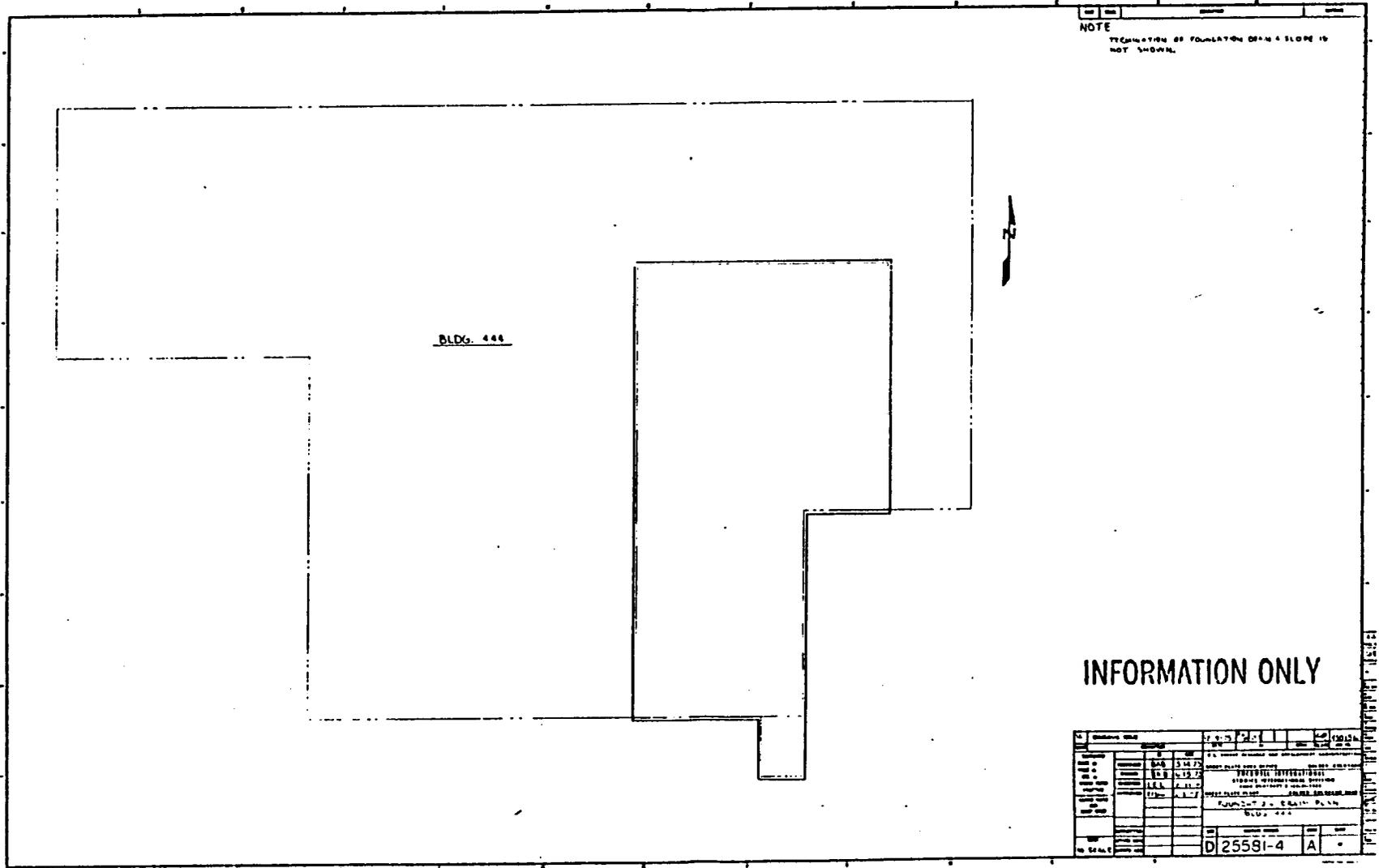


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INFORMATION ONLY

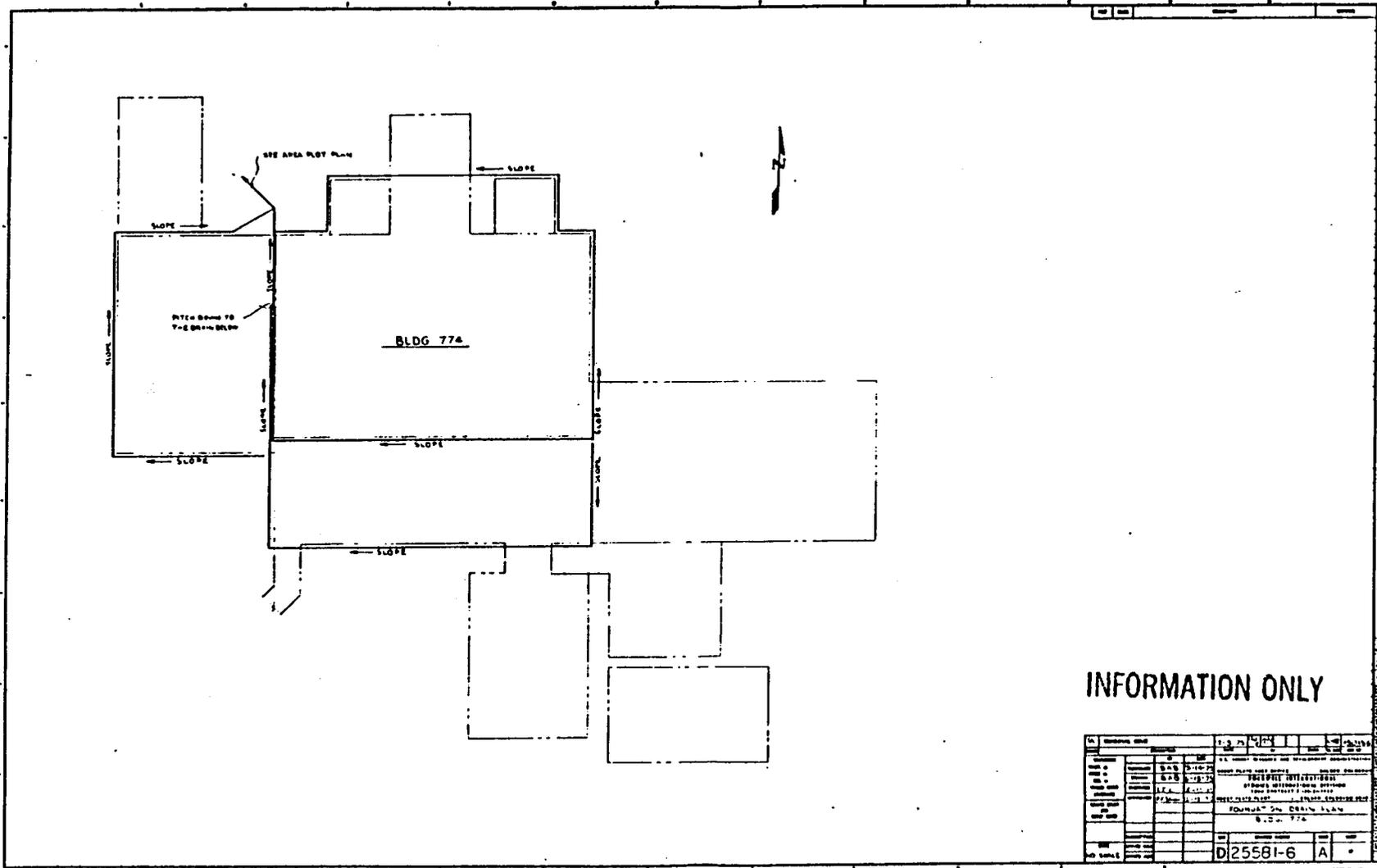
A		582		11-02-92	
SUPERVISOR: [blank] PROJECT: [blank] DRAWING NO: D/25581-3 SHEET NO: A					

Figure 5: Building 444 Foundation Drain Plan



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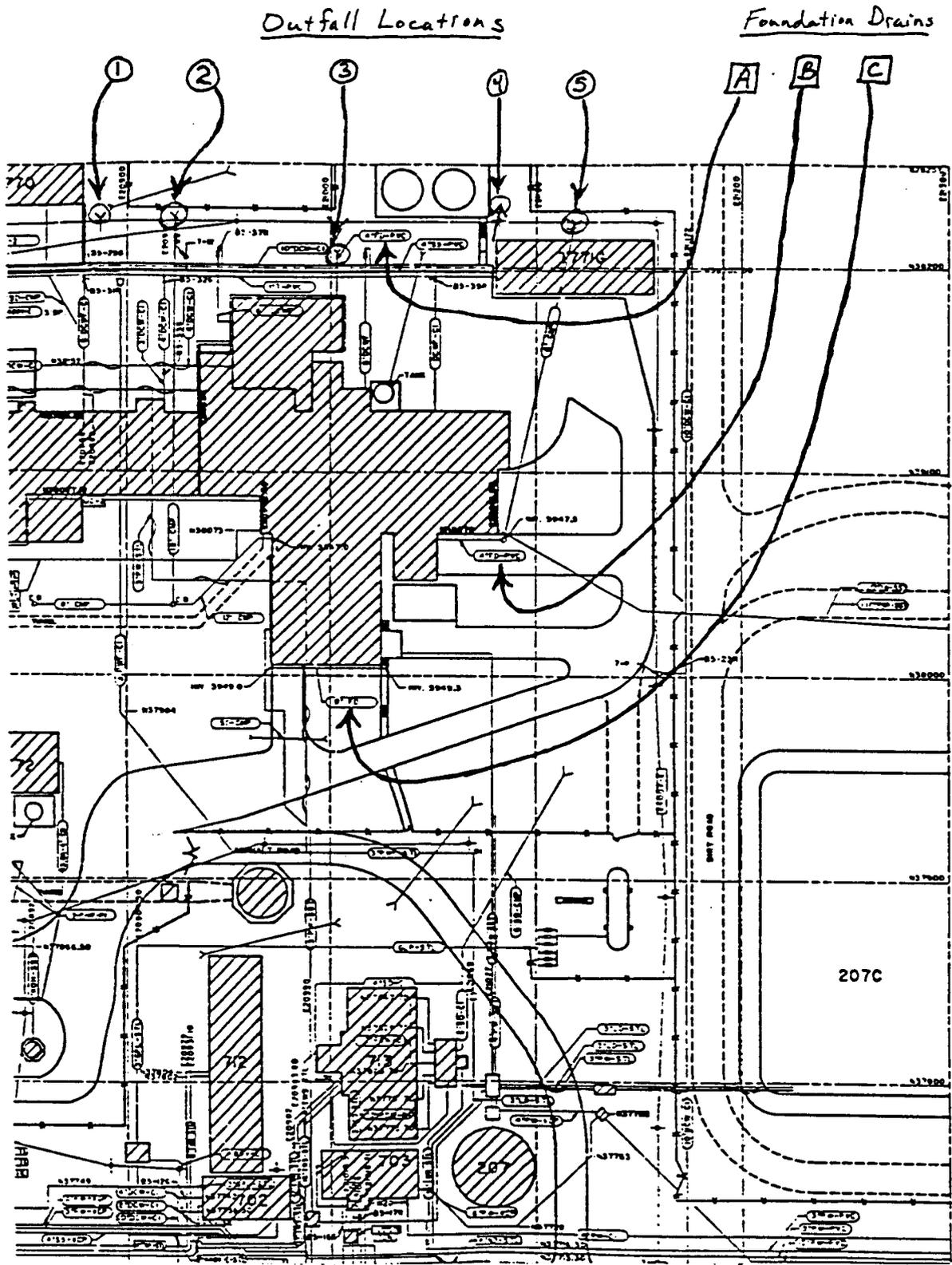
Figure 8: Building 774 Foundation Drain Plan



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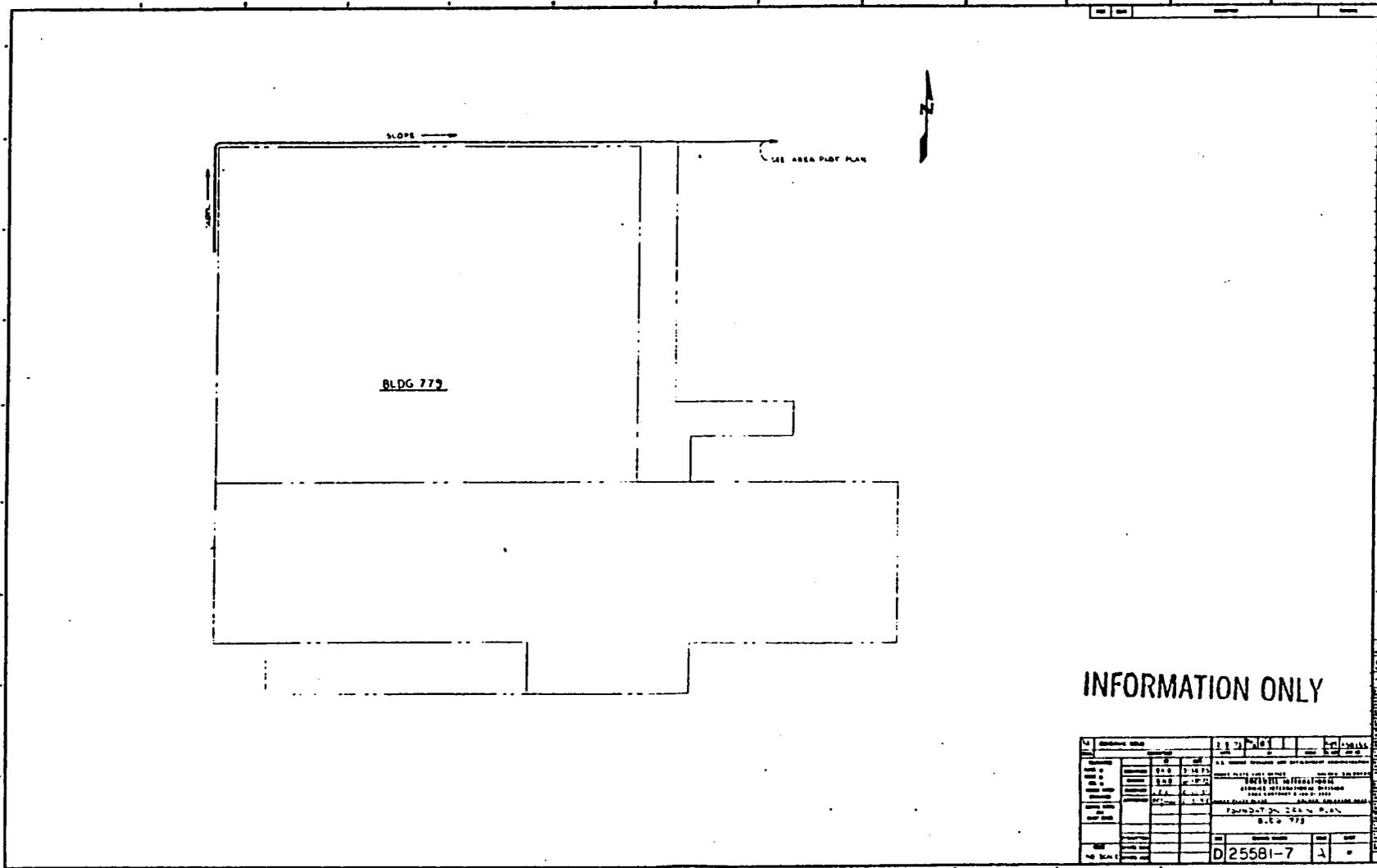
November 2, 1992

Figure 9: Buildings 774 Foundation Drain And Flow Outfalls



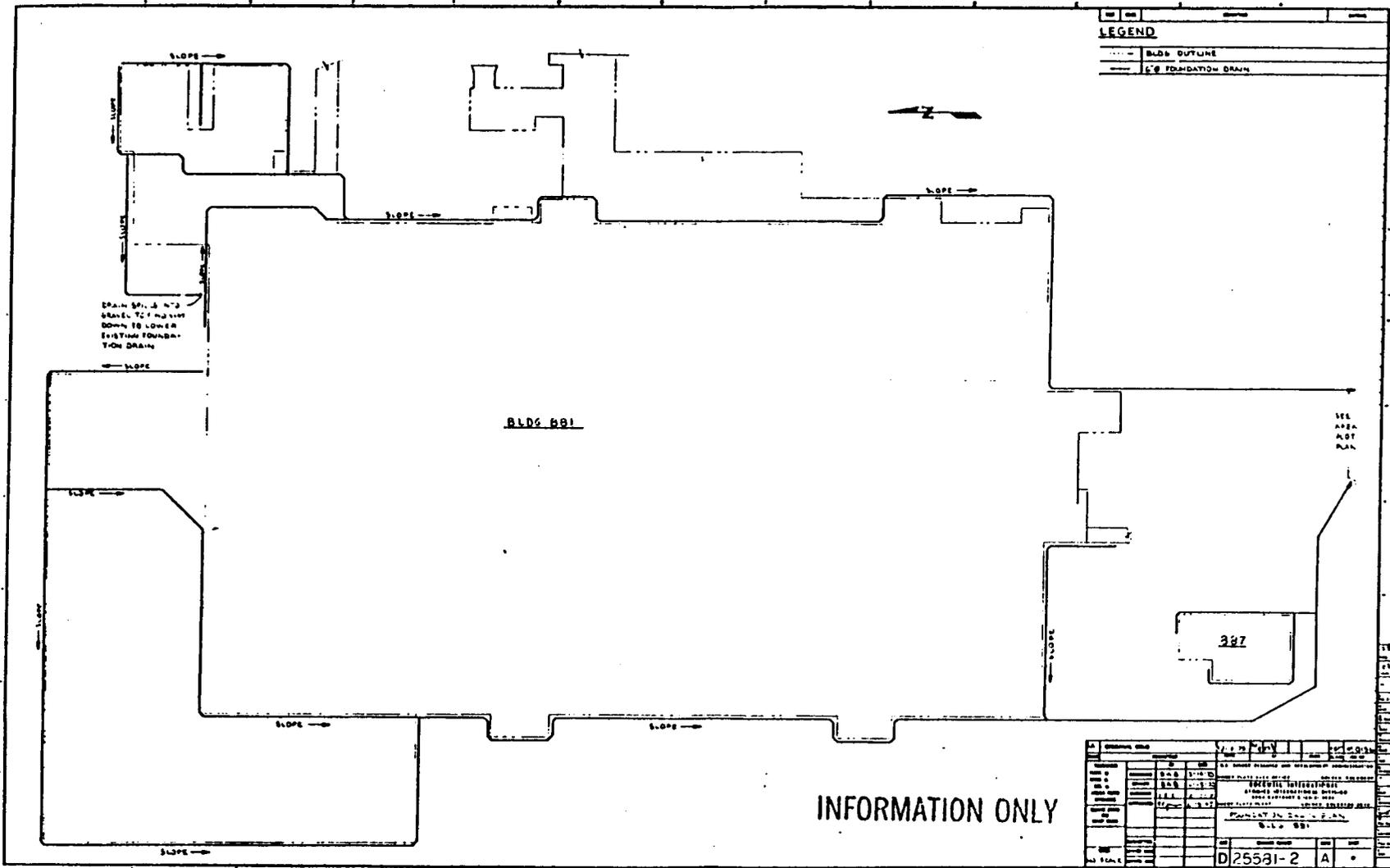
9-B 3107 335

Figure 10: Building 779 Foundation Drain Plan



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Figure 11: Building 881 Foundation Drain Plan



November 2, 1992

November 2, 1992

Table 1

May 19, 1977

M. V. Werkema

N. E. Moody

Locations of Building Sump and Foundation Drains

- | | |
|---------|---|
| FD111-1 | Drain in gully outside security fence north of the northeast corner of the building halfway to Sage Avenue. (Probably dry) |
| FD371-1 | Confluence of two drains in the gully southeast of the southeast corner of the building. (Should always have water but may be necessary to dig a hole to collect the water) |
| FD371-2 | Drain in the gully east of the building and north of the road across the gully. (Should always have water but may be necessary to dig a hole to collect the water) |
| FD371-3 | Drain on hillside northeast of 518 power substation. (Probably dry most of the year. May be necessary to bury a container under the outlet of the drain) |
| FD371-4 | Reserved for a future location on the north side of the building - possibly a test hole. |
| FD371-5 | Storm drain grating across from the loading dock at the southwest corner of the building. (Should have water) |
| FD444-1 | Drain on hillside outside the plant security fence directly north of the southwest corner of the building. Cattails and ground slippage along side the road identify this location. (Large flow of water) |
| BS444-2 | Sump inside building at the southeast corner of the "snake pit." (Should always have water) |

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M. V. Werkema
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- FD707-1 Sampling location is the storm drain outlet across the road from east side of the 750 parking lot. This drain should pick up water from buildings 559, 750, 776, 777, 778, and 707 plus the land area east of the buildings. (Should always have water)
- BS707-2 Sump in pump pit between cooling tower and Building 707. (Should always have water)
- BS707-3 Sump in "old" process drain manhole outside Door 3 to Building 778. (Water table unknown)
- FD774-1 Drain located just east of Building 770. (Should have water)
- FD771-1 Drain located in the bank of the gully between the parking lots northwest of the building. (Should have water)
- BS771-2 Sump in Room 146. (Water table unknown)
- BS771-3 Sump in elevator pit. (Water table unknown)
- FD77 -1 Drain line runs between ponds 207C and 207A. The outlet is down the hillside. Care must be taken to sample only the drain since the hillside is saturated with seepage from the solar evaporation ponds. (Water table unknown)
- BS865-1 Sump in manhole on west side of building. (Water table unknown)
- FD881-1 Drain on hillside outside of security fence south of the middle of the building. A cattail growth marks this location. (Always has water)

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M. V. Werkema
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May 19, 1977

- BS881-2 Sump in elevator shaft by the boiler room.
 (Water table unknown)
- BS881-3 Sump under the stairway in the northeast
 corner on the first floor. (Always has water)
- BS883-1 Sump pump in manhole directly west of south-
 west corner of building. (Water table unknown)
- BS887-1 Sump in the northwest corner of the lowest
 section (Water table unknown)
- FD991-1 Drain in gully outside security fence due east
 of the northeast corner of the building.
 (Water table unknown).

N. E. Moody
General Laboratory

November 2, 1992

Table 2

LOCATIONS OF FOUNDATION DRAINS AND BUILDING SUMPS

FD111-1	Drain in gully outside security fence north of the northwest corner of the building halfway to Sage Avenue. (Probably dry)
FD371-2	Daylights in the gully southeast of the southeast corner of building 374. A gate valve and small concrete basin mark the spot. The 12 inch diameter effluent pipe has a hinged cap on it.
FD371-3	Daylights northeast of FD371-2 in the gully. It can be found on the northeast side of the access road to 517/518 substation. It is marked by the same construction characteristics of FD371-2.
FD371-4	Daylights southwest of FD371-3 on the west side of the access road to the 517/518 substation. It drains water from this substation.
FD371-5	Daylights northeast of the 517/518 substation.
FD371-6	Also daylights northeast of the 517/518 substation due east of FD371-5.
FD444-1	Drain on hillside outside the plant security fence directly north of the southwest corner of the building. Cattails and ground slippage along side the road identify this location. (large flow of water)
BS444-2	Sump inside building at the southeast corner of the "snake pit." (should always have water)
FD516-1	Drain is located on the south side of the road into the 516 power substation. Cattails also identify this location. (Should always have water but unable to locate the source. Could be as far away as Building 776)
FD707-1	Sampling location is the storm drain outlet across the road from east side of the 750 parking lot. This drain should pick up water from buildings 559, 750, 776, 777, 778, and 707 plus the land area east of the buildings. (Should always have water)
BS707-2	Sump in pump pit between cooling tower and Building 707. (Should always have water)
BS707-3	Sump in "old" process drain manhole outside Door 3 to Building 778. (Water table unknown)

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LOCATIONS OF FOUNDATION DRAINS AND BUILDING SUMPS
(CONTINUED)

FD774-1 Drain located just east of Building 770. (Should have water)

FD771-1 Drain located in the bank of the gully between the parking lots northwest of the building. (Should have water)

BS771-2 Sump in Room 146. (Water table unknown)

FD771-4 Drain located on the flat ground west of FD771-1. (Should always have water)

FD779-1 Drain line runs between ponds 207C and 207A. The outlet is down the hillside. Care must be taken sample only the drain since the hillside is saturated with seepage from the solar evaporation ponds. (Water table unknown)

BS865-1 Sump in manhole on west side of building. (Water table unknown.)

FD881-1 Drain on hillside outside of security fence south of the middle of the building. A cattail growth marks this location. (Always has water)

BS881-2 Sump in elevator shaft by the boiler room. (Water table unknown)

BS881-3 Sump under the stairway in the northeast corner on the first floor. (Always has water)

BS983-1 Sump pump in manhole directly west of southwest corner of building. (Water table unknown)

BS887-1 Sump in the northwest corner of the lowest section. (Water table unknown)

FD991-1 Drain in gully outside security fence due east of the northeast corner of the building. (Water table unknown)

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Table 3

LOCATIONS OF FOUNDATION DRAINS AND BUILDING SUMPS

- FD 111-1 Drain in gully outside security fence north of the northwest corner of the building halfway to Sage Ave.
- FD 371-2 Daylights in the gully southeast of the southeast corner of building 374. A gate valve and small concrete basin mark the spot. The 12 inch diameter effluent pipe has a hinged cap on it.
- FD 371-3 Daylights northeast of FD 371-2 in the gully. It can be found on the northeast side of the access road to 517/518 substation. It is marked by the same construction characteristics of FD 371-2.
- FD 371 Composite Collect the sample in the creek down the hill between the northeast corner of substation and the road to 771.
- FD 444-1 Drain on hillside outside the plant security fence directly south of the southwest corner of the building. It is due south of the current location along the road to Pond C-1. A 3 inch pipe helps identify the location.
- BS 444-2 Sump inside building at the southeast corner of the "snake pit." (should always have water)
- FD 516-1 Drain is located on the south side of the road into the 516 power substation. The drain is slightly south and west of the current sampling location and a culvert helps identify the location.
- FD 707-1 Sampling location is the storm drain outlet across the road from east side of the 750 parking lot. This drain should pick up water from buildings 559, 750, 776, 777, 778, and 707 plus the land area east of the buildings. (Should always have water)
- BS 707-2 Sump in pump pit between cooling tower and Building 707. (Should always have water)
- BS 707-3 Sump in "old" process drain manhole outside Door 3 to Building 778. (Water source unknown)
- FD 774-1 Drain located just east of Building 770. Collect the sample from the eastern most drain. The drain just east of Building 770 is a storm drain. Do not collect the sample here.
- FD 779-1 Drain line runs between ponds 207C and 207A. The outlet is down the hillside. Care must be taken to sample only the drain since the hillside is saturated with

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LOCATIONS OF FOUNDATION DRAINS AND BUILDING SUMPS
(CONTINUED)

- seepage from the solar evaporation ponds. (Water source unknown)
- BS 865-1 Sump in manhole on west side of building. (Water source unknown)
- FD881-1 Drain on hillside outside of security fence south of the middle of the building. A cattail growth marks this location. (Always has water)
- BS 881-3 Sump under the stairway in the northeast corner on the first floor. (Always has water)
- BS 883-1 Sump pump in manhole directly west of southwest corner of building. (Water source unknown)
- FD 991-1 Drain in manhole inside security fence due east of the northeast corner of the building. (Water source unknown)
- FD 860-1 Drain located approximately 50 feet south of Building 860 outside the Plant security fence.

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Table 4

SITE DESCRIPTIONS OF FOOTING DRAINS AND BUILDING SUMPS

BS 111-2: Sump located in southeast corner of the basement of Building 111.

FD 371-3: Drain outfall located on northeast side of the access road to 517/518 substation. This location is identified by a gate valve with 12 inch diameter flapper valve behind it.

FD 371 MC: This metal culvert is located on the west side of the gully that is on the east side of Building 371. This culvert is identified by being a 12 inch diameter corrugated metal pipe.

FD 444-460: The drain is located in the Buffer Zone directly south of Building 664 on the road to C-1 Pond. The drain can be identified by the concrete culvert located on the north side of the South Interceptor Ditch (SID).

FD 559-561: The drain is located east of Building 561 Door 1 and south of Building 559 door 6. The drain can be identified by the manhole cover.

BS 707-2: Sump is located in pump pit between the cooling tower and Building 707.

FD 771-1: Drain is located approximately 50 feet southwest of the southwest corner of the old 776 guardpost.

FD 774-1: Drain located east of Building 770. Drain can identified by the sign that marks Surface Water (SW) sampling location 84.

FD 779-1: Drain is located on the hillside south of the solar ponds . The drain can be located by the broken concrete culvert with the red sandstone rocks.

FD 790: Drain is located in the manhole on the southwest corner of Building 790.

FD 850-1: Drain is located in the Buffer Zone south of the southeast corner of Building 850.

BS 865-1: Sump is located in pump pit on the west side of Building 865. Sump can be identified by square shape metal cover on the pump pit.

FD 865-2: Drain is located outside of Door 1 of Building 865.

FD 883-1: Drain is located in manhole outside of Door 17, on the southwest corner of building 883. The drain can be identified by the manhole being elevated approximately 2 ft. above the ground.

FD 886-1: Drain is located at the northwest corner of Building 875.

FD 910: Drain is located in a manhole on the north side of Building 910. The manhole is covered by the piping on the north side of the building.

BS 991-2: Sump is located in the southeast corner of the basement of Building 991. Sump can be identified by the metal cover bolted to the floor.

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50