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W-314 Waste Transfer Alternative Piping System Description

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U.S. Department of Energy Contract DE-AC06-96RL13200

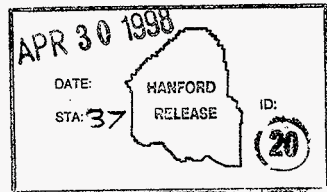
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Abstract: It is proposed that the reliability, operability, and flexibility of the Retrieval Transfer System be substantially upgraded by replacing the planned single in-farm pipeline from the AN-AV-AZ-(SY) Tank Farm Complex to the AP Farm with three parallel pipelines outside the tank farms. The proposed system provides simplified and redundant routes for the various transfer missions, and prevents the risk of transfer gridlock when the privatization effort swings into full operation.

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Revision 0

**W-314 WASTE TRANSFER
ALTERNATIVE PIPING
SYSTEM DESCRIPTION**

April 1998

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EXECUTIVE SUMMARY

It is proposed that the reliability, operability, and flexibility of the Retrieval Transfer System be substantially upgraded by replacing the planned single in-farm pipeline from the AN-AY-AZ-(SY) Tank Farm Complex to the AP Farm with three parallel pipelines outside the tank farms. The proposed system provides simplified and redundant routes for the various transfer missions, and prevents the risk of transfer gridlock when the privatization effort swings into full operation.

These upgrades can be provided at a substantially reduced cost, with cost reductions through Part 2 of Project W-314 estimated to exceed \$35 million. Smaller cost avoidances can also be realized in Project W-211. A significant advantage is that greater confidence can be placed in the construction schedule, as the predominantly greenfield construction work proposed is less subject to unpredictable delays in radiation zones and highly contaminated areas. Aside from construction cost avoidances, the major incentive for implementing this proposal is the greater reliability the new transfer system provides to the vitrification vendor feed deliveries.

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LIST OF TERMS

DCRT	Double-contained receiver tank
DOE	U.S. Department of Energy
DST	Double-shell tank
FY	Fiscal year
HLW	High-level waste
HPT	Health Physics Technician
LAW	Low-activity waste
MPS	Master Pump Shutdown
SPC	Special Protective Coating
TEDF	Treated Effluent Disposal Facility
TPC	Total Project Cost
TWRS	Tank Waste Remediation System

W-314 WASTE TRANSFER ALTERNATIVE PIPING SYSTEM DESCRIPTION

1.0 PROPOSAL

It is proposed that the reliability, operability, and flexibility of the Retrieval Transfer System be substantially upgraded by replacing the planned single in-farm pipeline from the AN-AY-AZ-(SY) Tank Farm Complex to the AP-AW Farms with three parallel lines outside the tank farms. These upgrades can be provided with a substantial cost reduction without adversely affecting the transfer schedule.

This proposal offers independent routings for simultaneous transfers of different types of wastes. The independent lines offer greatly simplified transfer paths that provide a higher level of reliability than is possible with the complex manifold system required by a single line. The proposed routes are designed to provide backup capability for each transfer mission. The combination of independent routes, spare capacity, and system simplicity provides a high level of assurance that transfer commitments can be carried out as scheduled.

2.0 PROPOSAL SUMMARY

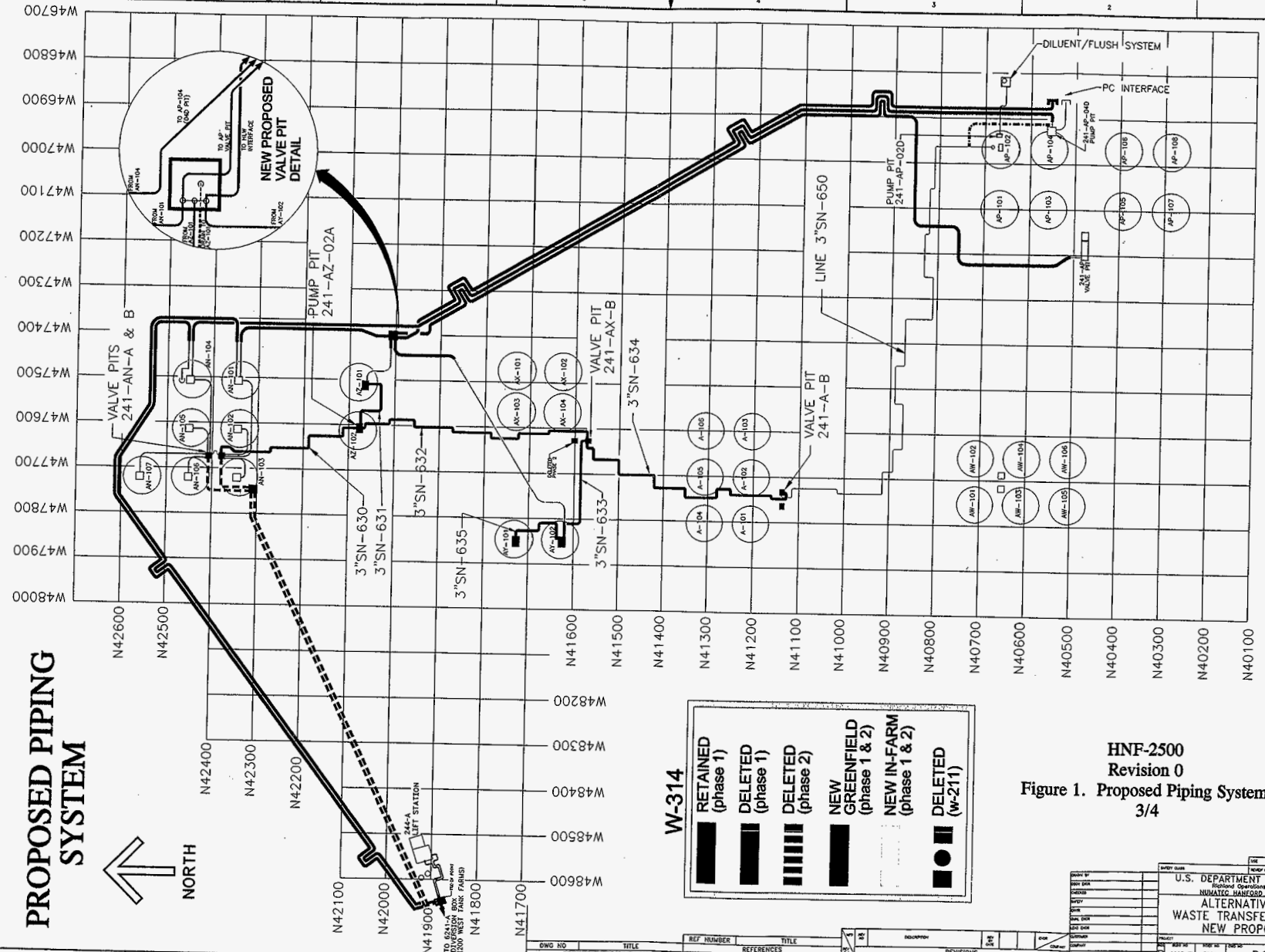
Figures 1, 2, and 3 show the proposed piping system. The proposal calls for constructing the bulk of the new transfer system in nonradiological areas using the shortest and most direct routes available. The cross-site transfer lines are extended from a point just west of the 244-A lift station around the north and east sides of AN farm to tanks 241-AN-101 and -104 using a new above grade berm, and a new extension of the AN farm plateau. The high pressure cross-site line enters tank 241-AN-104, and the low pressure line enters the 241-AN-101 pump pit for connection to the existing AN farm transfer system. A new line runs directly from the 241-AN-104 pump pit to the 04D pit on tank 241-AP-104, the staging point for Low-Activity Waste (LAW) deliveries. New lines from the pump pits on tanks 241-AY-102, 241-AZ-101, and 241-AN-101 connect to a new valve pit just east of tank 241-AZ-101. Manifold jumpers in the new pit tie the lines to two direct transfer lines routed to the AP valve pit and to the privatization High-Level Waste (HLW) interface point just east of tank 241-AP-104. The three new lines to AP farm run parallel for 0.5 miles cross-country to the AP tank farm. The route crosses Canton Avenue on an earthen fill and continues around the east side of the 207-A retention basins to the northeast corner of the AP tank farm. In AP Farm, the lines separate to connect to the HLW vendor interface point, to the tank 241-AP-104 04D pump pit, and to the AN valve pit, respectively. The currently planned new Project W-314 pipelines connecting tank 241-AY-101 to tank 241-AY-102 and tank 241-AZ-102 to tank 241-AZ-101 are retained, as are most of the AN valve pit upgrades. The currently planned

“East-West” pipe system through the A Farm complex is deleted. The resulting system provides improved capability for routing between any A Complex double-shell tanks.

This proposal greatly reduces the number of transfer system components, including jumpers, valves, valve actuators, position switches, and leak detector elements, reducing the risk of point failures. Reliability of the transfer system is increased by maximizing route system simplicity and by providing spare and redundant capacity between the AN-AZ-AY-SY tanks and the AP-AW tank farms.

By performing the bulk of pipeline construction outside radiological areas, and by deleting upgrades to the aging 2-in. backup pipelines that are no longer needed, cost reductions of approximately \$35 million are projected. Additional cost avoidances above this figure depend on Project W-314 decisions related to the cross-site transfer line re-routing to AN farm or the alternative of upgrading the 244-A lift station.

PROPOSED PIPING SYSTEM



PLAN

W-314

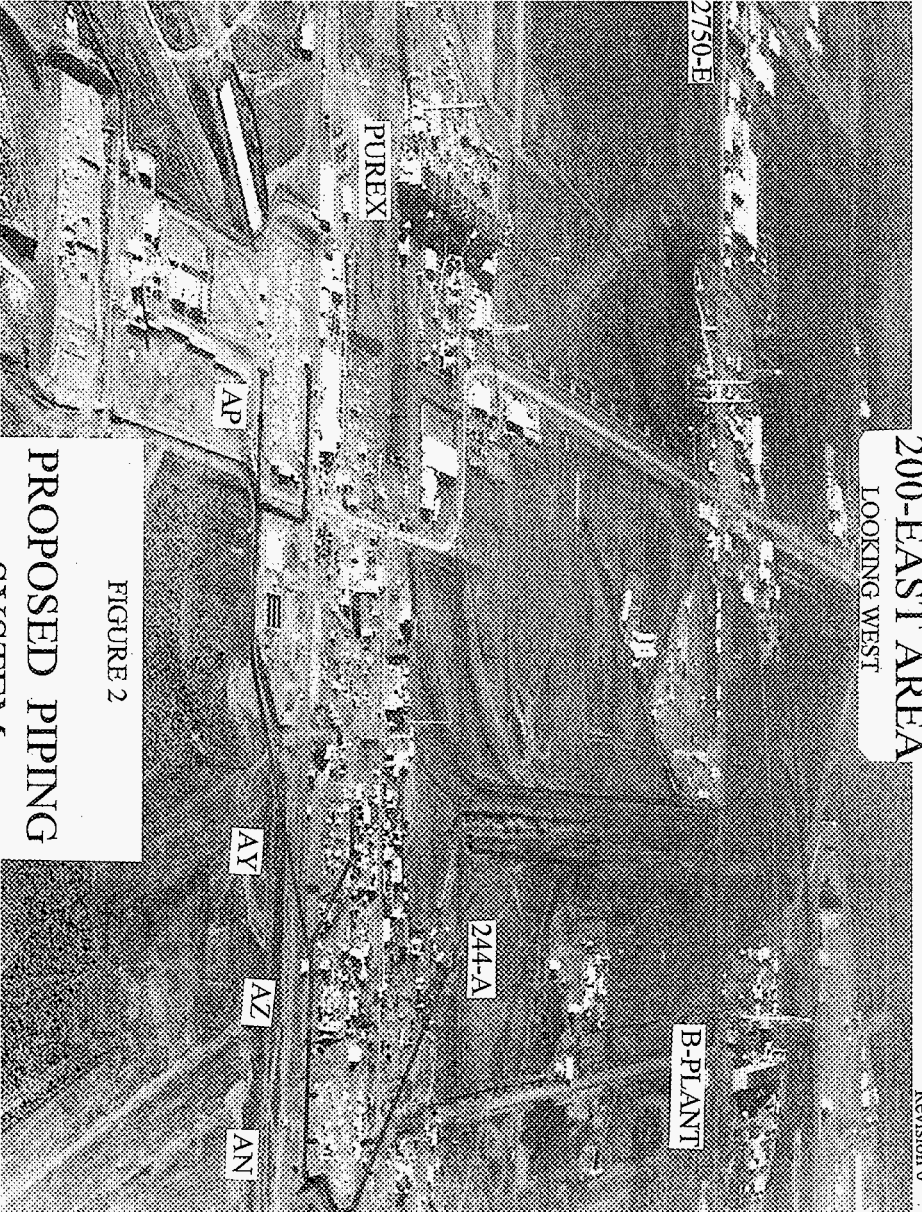
	RETAINED (phase 1)
	DELETED (phase 1)
	DELETED (phase 2)
	NEW GREENFIELD (phase 1 & 2)
	NEW IN-FARM (phase 1 & 2)
	DELETED (W-211)

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Figure 1. Proposed Piping System.
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200-EAST AREA
LOOKING WEST



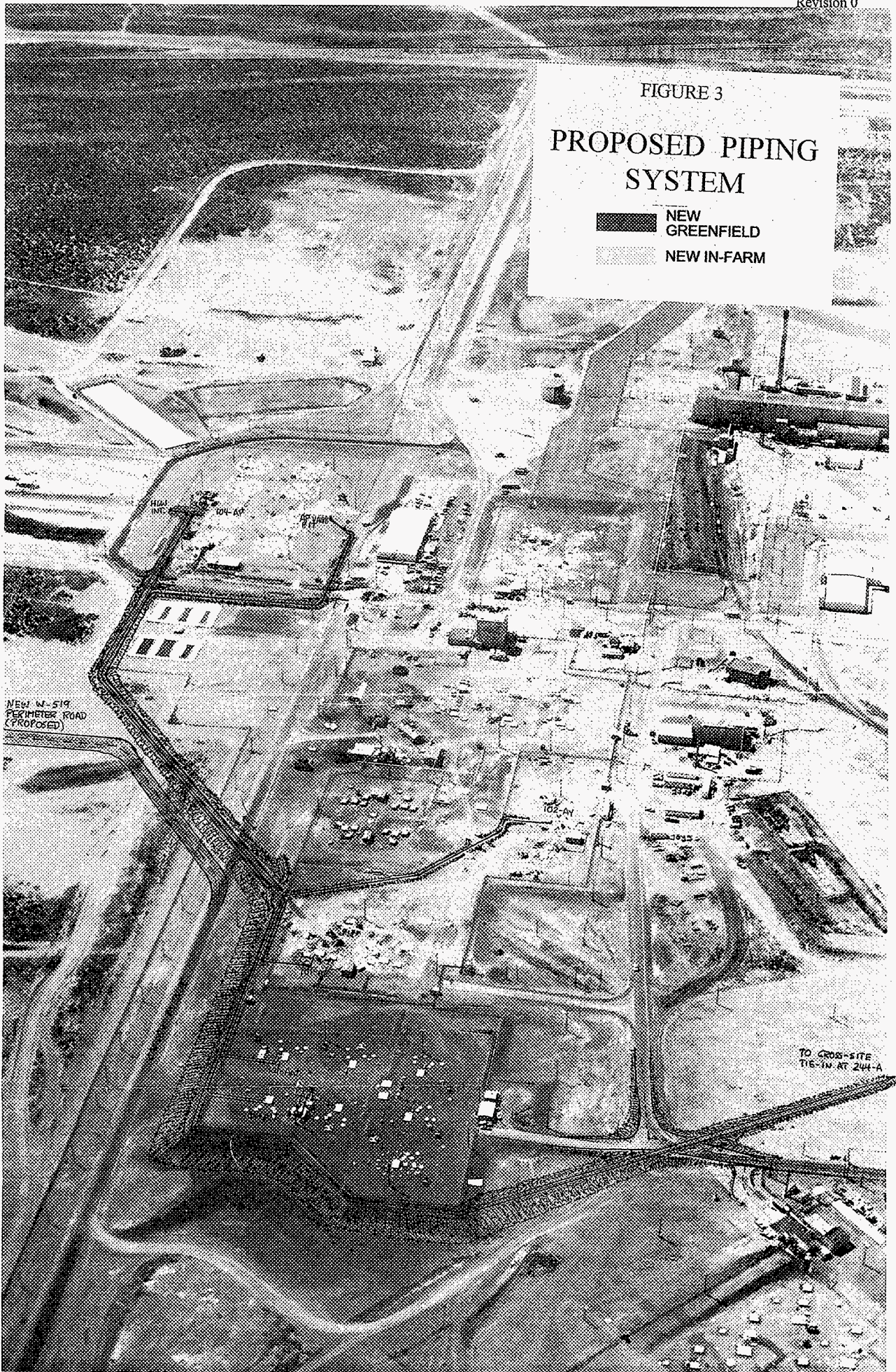
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FIGURE 2

PROPOSED PIPING
SYSTEM

FIGURE 3
PROPOSED PIPING
SYSTEM

NEW
GREENFIELD
NEW IN-FARM



3.0 THE NEED FOR A SIMPLIFIED 3-ROUTE SYSTEM

Experience has shown that equipment failures are directly proportional to complexity and that it is extremely difficult and time consuming to make repairs to in-farm systems. The necessarily complex nature of a single do-it-all route produces significant reliability risks in a radioactive environment where timely repairs are virtually impossible. The single-pipe system also lacks critically needed routing capability to accommodate competing programs, and cannot provide spare capacity. A more reliable system with redundant capacity is thus proposed to avoid costly non-delivery penalties in the future.

4.0 SUMMARY OF THE PREFERRED PIPING SYSTEM ALTERNATIVE

Eight alternatives for the proposed piping system were evaluated. The preferred alternative is shown in Figures 1, 2, and 3, and is described below. A more detailed description is found in Appendix A. A description and evaluation of the alternatives are found in Appendix B.

The proposed pipeline system upgrades the reliability and availability of the waste feed delivery system to the privatization contractors through the application of the following principles:

- Maximizing simplicity by minimizing the number of components in any one transfer route; i.e., fewer valves, jumpers, position switches, leak detectors, motor drives, etc.
- Providing at least two independent trunk transfer routes for any given transfer mission.
- Optimizing operational aspects by providing straight-through routes where feasible and minimizing the impact of valve line-ups and field verifications.

The proposed piping arrangement is designed to assure that all needed A-Farm Complex double-shell tank (DST) transfers can be made. The system routes waste from the SY tanks to the AN Farm, and is capable of transferring waste from any A-Farm complex DST to any other A-Farm complex DST. The system also maintains the ability to receive waste from the 204-AR unloading facility into AW tank farm.

The Privatization LAW and HLW transfers can be made by using no more than 8 valves per transfer, which is a 75 percent reduction over the currently planned routing.

The central feature of the new system is the set of three lines leading south from the AZ Farm fence line to the AP Farm. Tie-in connections to the AN-AY-AZ complex and to the SY tanks (via the cross-site transfer lines) are provided on the north end. A similar distribution system directs the pipelines on the AP-AW farm end.

4.1 AN-AZ-AY-(SY) ROUTING TO THE TRANSFER LINE TIE-IN POINT

A system of existing and new pipelines connects to the three transfer lines leading to AP Farm.

4.1.1 West Area Waste Feed

West Area wastes are transported via the new WT-LL-3150 and -3160 cross-site pipelines to a point just west of the 244-A Lift Station. The tie-in to the 244-A valve pit is removed, and the cross-site lines are extended to AN farm from a point just west of 244-A as shown in Figure 1. The cross-site lines are routed around the north and east sides of AN Farm to tanks 241-AN-101 and 241-AN-104.

The high pressure cross-site line (the line equipped with a 1,400 psi booster pump) is routed directly into tank 241-AN-101 via a drop leg, eliminating the need for relief valves and rupture discs to protect the existing piping system. From tank 241-AN-104, accumulated wastes can be pumped to any A-Farm complex DST using the 241-AN-104 pump.

The low pressure cross-site line (connected to a low-pressure pump without an installed booster) is connected to a new manifold jumper in the tank 241-AN-101 central pump pit. From the manifold jumper, the waste can be routed directly either into tank 241-AN-101 or to any other A-Farm complex DST without entering tank 241-AN-101 under appropriate pumping conditions. This routing also allows dilute A-complex wastes to be pumped from any A-Farm complex DST to SY farm if needed.

4.1.2 AN Farm Waste

Proposed AN Farm transfer routes are shown in Figure 1. AN Farm waste can be pumped via multiple routes from any AN-Farm tank to the AP-AW tank farms. One routing is via the AN valve pits and the 241-AN-104 pump pit. From the 241-AN-104 pump pit waste is transferred directly to the AP-04D pit, which serves the Privatization Intermediate Waste Storage Tanks. AN Farm waste can also be pumped to any A-Farm complex tank via the AN valve pits, the 241-AN-101 pump pit, and a new valve pit constructed adjacent to the AZ farm fence. The new pit provides access to the AY and AZ tanks, as well as to the HLW privatization interface and to the AP valve pit.

4.1.3 AY Farm Waste

Proposed AY Farm transfer routes are shown in Figure 1. AY Farm wastes can be pumped to any A-Farm complex DST and the Privatization HLW interface via new lines from 241-AY-101 to 241-AY-102 and from 241-AY-102 to the new AZ valve pit. The new AZ valve pit provides continued routings to the Privatization HLW interface, the AP valve pit, and the AZ and AN farms.

4.1.4 AZ Farm Waste

Proposed AZ Farm transfer routings are shown in Figure 1. AZ Farm waste feed can be pumped to any A-Farm complex DST and the Privatization HLW interface via new lines from tank 241-AZ-102 to tank 241-AZ-101, and from tank 241-AZ-101 to the new AZ valve pit. The AZ valve pit provides routings to the Privatization HLW interface, the AP valve pit, and to the AY and AN farms.

4.2 THE THREE PIPELINES--AZ FENCELINE TO AP FARM

Three parallel trunk lines are provided from a point just outside the east AZ Farm fence line to AP Farm as shown in Figure 1. One line originates in the tank 241-AN-104 pump pit. The other two lines originate in the new AZ valve pit. The three lines cross Canton Avenue on a 4-m (12-ft) high berm and skirt the east side of the 207-A retention basin. Two lines continue into AP Farm along the east side fence to the AP-04D pit and to the HLW interface point respectively. The third line turns west and enters AP Farm along the west fence line, terminating in the AP valve pit.

4.3 AP FARM LINE TERMINATION

In AP farm one line from the AZ valve pit terminates at the privatization contractor HLW interface point east of tank 241-AP-104, using the same interface point as currently identified in Project W-211 documents.

One line from the tank 241-AN-104 central pump terminates in the new Project W-211 04D pit on tank 241-AN-104. Waste can be routed to the Intermediate Waste Feed Staging Tanks 241-AP-102 and 241-AP-104. This line can also be used as an alternate route to the Privatization HLW interface point and to the AP valve pit.

One line is routed from the new AZ valve pit to the AP valve pit for access to the AP or AW tank farms. This line can also be used as an alternate route for transfers to the privatization HLW contractor and for transfers to tanks 241-AP-102 and 241-AP-104.

4.4 COST

Cost of the proposed piping system, including the cross-site line re-route, is \$52.0 million, which is \$2 million less than Part 1 of the current Project W-314 that does not include the cross-site re-route. When Project W-314 Part 2 cost avoidances are added, total cost reductions are \$37 million. Additional reductions are possible if the cross-site re-route is included in the original Project W-314 Part 2 scope.

4.5 SCHEDULE

The construction schedule prepared for the revised piping system shows a completion date of October 25, 2000, assuming a decision to proceed is made by early May 1998. The completion date is six months later than the current Project W-314 Part 1 completion date. This schedule requires utilization of the existing transfer piping for an additional six months. The 2000 completion is not expected to impact scheduling for planned transfers.

5.0 DETAILED DESCRIPTION OF PREFERRED ALTERNATIVE

Alternative 7B is the preferred alternative. The proposed transfer system uses a combination of existing pipelines, new pipelines planned by the current Project W-314 design, and new pipelines originated by this proposal. The central feature of the proposal is a set of three parallel pipelines that connect the AY, AZ, AN, and cross-site systems to the AP system.

The following features are retained from the currently planned Project W-314:

1. The planned W-314 line SN-635 from the 241-AY-101 central pump pit to the 241-AY-102 central pump pit
2. The planned W-314 line SN-631 from the 241-AZ-101 central pump pit to the 241-AZ-102 central pump pit
3. Part of the AN-A and AN-B valve pit upgrades, specifically the flush jumpers and part of the transfer jumper manifolds

The following W-314 features are deleted:

1. AX-A valve pit upgrades by Project W-314, Phase 2
2. AX-B valve pit upgrades by Project W-314
3. A-A valve pit upgrades by Project W-314, Phase 2
4. A-B valve pit upgrades by Project W-314
5. Pipeline SN 632 from the AZ-02A pump pit to the AX-B valve pit (W-314)
6. Pipeline SN 634 from the AX-B valve pit to the A-B valve pit (W-314)
7. Pipeline SN-630 from the AN-B valve pit to the AZ-02-A pump pit
8. Pipeline SN-633 from the AY-02A pump pit to the AX-B valve pit.

5.1 THREE-LINE PIPING SYSTEM FROM AZ FENCE LINE TO AP FARM

This pipe proposal provides three new 3-in. encased pipelines from the AN/AZ farm eastern boundary to the AP tank farm as shown in Figure 1. The lines are to be constructed above ground on a new earthen fill through non-radiological areas.

5.1.1 Pipelines

Each line will be built as a 3-in. schedule 40 stainless steel pipe inside a 6-in. carbon steel pipe. Thermal expansion loops are constructed at maximum 200 m (600-ft) intervals. In expansion loops the outer pipe is increased to a 12-in. line. The pipelines are insulated and are not provided with cathodic protection. The lines are bedded in structural backfill and covered with 1 m (3 ft) of earthen fill. General design requirements are identical to those of Project W-314.

The lines are sloped uphill from the AZ Farm fenceline to their AP Farm termination points. Total elevation rise is approximately 23 m (7 ft), and the minimum gradient is 0.25 percent.

5.1.2 Berm Construction

The pipeline berm leaves the AZ Farm eastern perimeter area near grade level and rises through non-radiological areas at a minimum grade of 0.25 percent to AP tank farm. The berm layout is shown in Figure 4. The berm crosses Canton Avenue approximately 4 m (12 ft) above grade. The height of the fill gradually decreases to about 2 m (6 ft) just north of the AP tank farm. Bulk fill for berm construction will be hauled by scraper from the grout vault spoil pile located 0.5 miles east of AP farm. Eighty percent of this large spoil pile is available until August of 1999. If the fill haul is delayed beyond this time frame, fill will be hauled from the equidistant submarine trench spoil pile. The fill will be compacted and sloped at 2:1. The earth fill will be hydroseeded for slope stabilization. Gravel or riprap will not be used except where necessitated by close proximity to roadways or structures.

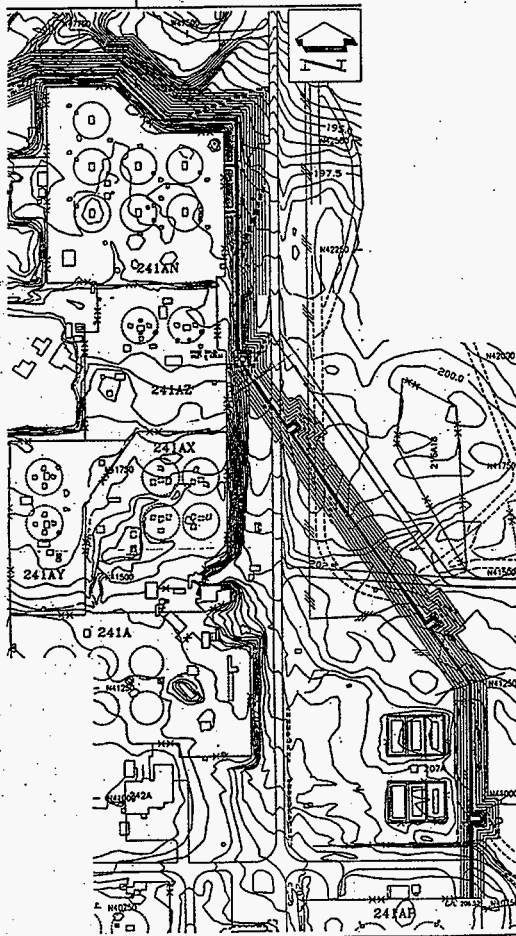
The pipeline berm is located to avoid existing equipment and structures. The backflow preventer cabinet along Canton Avenue east of AZ farm will be protected with a concrete retaining wall. Alternately, it may be relocated approximately 16 m (50 ft) to the north to avoid being buried by the berm. The berm will be constructed between the two manholes on the underground waste water pipeline to the Treated Effluent Disposal Facility (TEDF) to avoid interference with serviceability of this line.

5.1.3 Canton Avenue Termination/Re-routing

Canton Avenue will be blocked by the new pipeline berm. The existing southern section of the roadway will terminate on the south side of the pipeline berm. Canton Avenue will continue to provide access to the A-Farm east gate.

A new perimeter road will be constructed by Project W-519 to serve the new vitrification plants east of the A-complex. The new road will connect to Canton Avenue just north of the pipeline berm, skirting the north side of the berm as shown in Figure 3.

Figure 4. Fill Design for Berm from AZ Fence Line to AP Farm.



5.2 AP FARM DISTRIBUTION PIPE LAYOUT

At the AP tank farm the trunk lines terminate in three locations:

5.2.1 Privatization High-Level Waste Interface Point

Two lines enter the northeast corner of the AP farm fenced area about 1 m (3 ft) below grade. It is intended to fence off the excavation area in the east side of AP Farm and to perform machine excavation in the clean area.

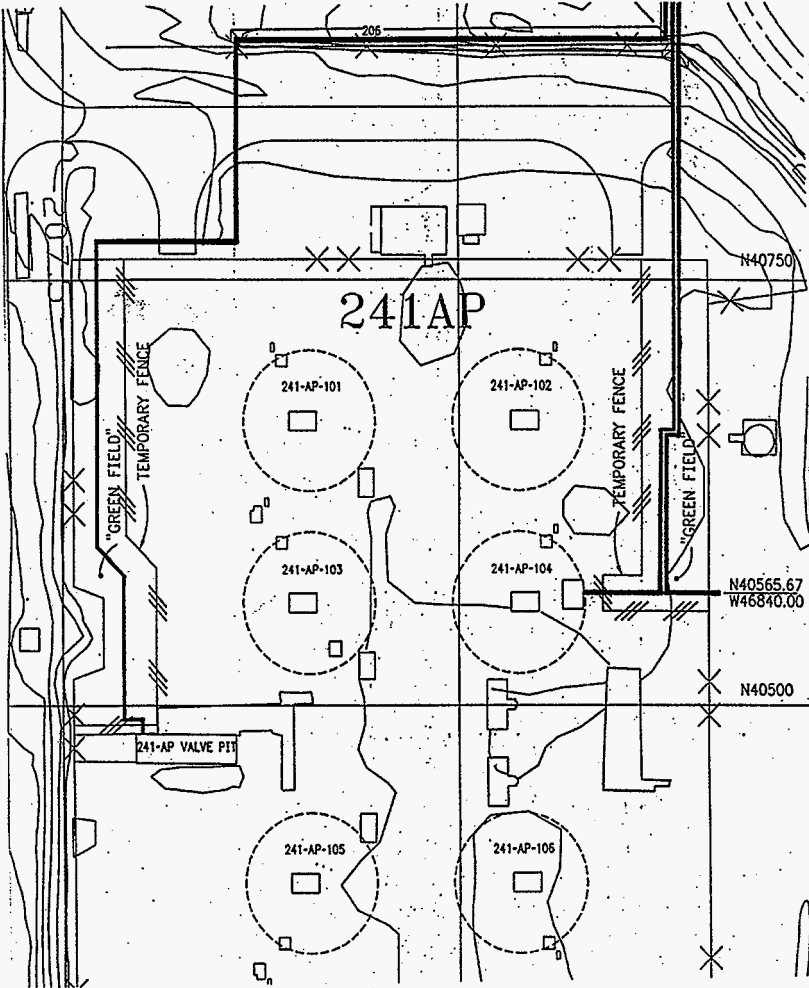
One line terminates at the Privatization HLW interface point just east of tank 241-AP-104, outside the fence line, as designated by Project W-211 and shown in Figure 5. The pipeline will be located approximately 1 m (3 ft) below grade at this point, and will terminate with a welded pipe cap. The HLW privatization contractor will be responsible for connecting to the pipe stub at this point.

Project W-211 plans to provide an additional HLW pipe from the new AP-04D pit to the HLW interface point. This line will be retained to serve as a backup HLW route. The backup routing utilizes the trunk line from the AZ valve pit to the AP valve pit and then routes the HLW stream via the AP-04A pump pit to the AP-04D pit and the new connecting line to the HLW interface. The vendor will be responsible for connecting into the two stub pipes at the HLW interface. The Project W-211 jumper design for the AP-04D pit will not need to be modified as it already contains the planned HLW connection.

5.2.2 AP-04D Pit

One line terminates at a point approximately 3 m (15 ft) east of the proposed new Project W-211 AP-04D pump pit as shown in Figure 5. Connection to the AP-04D pit will be made by Project W-211 to the nozzle currently designated for pipeline SN 650. The currently planned extension of line SN 650 from tank 241-AP-102 to tank 241-AP-104 will be deleted. The planned Project W-211 piping will allow routing waste to either tank 241-AP-102 or to tank 241-AP-104 using new piping and jumpers to be provided by W-211.

Figure 5. Pipe Routing into 241-AP Tank Farm.



5.2.3 AP Valve Pit

One line will be routed around the north and east sides of the AP tank farm to the AP valve pit, as shown in Figure 6. The line leaves the main trunk berm just north of 4th Street and then follows 4th Street to the west side of AP Farm. The line crosses under 4th Street and then enters AP Farm and follows the west fence line about 1 m (3 ft) below grade until it enters the AP Valve Pit. To facilitate pipeline construction, the west side of the AP tank farm will be fenced off as a nonradiological area, and trenching will be performed by machine excavation. Routing the line underground avoids interfering with equipment travel in AP Farm.

The new line will be tied into spare nozzle 15. New jumpers will be provided in the AP valve pit to connect into the existing transfer system as shown in Figure 6. From the AP valve pit wastes can be routed to or from any AP or AW tank. This connection can also be used as a spare LAW route to tanks 241-AP-102 and 241-AP-104 in the event the primary LAW routing is not available. In addition, HLW can be routed to the vendor interface point by utilizing the existing line to the 04A pump pit, and the HLW vendor interface point.

5.3 AY-AZ-AN-SY TRUNK LINE CONNECTIONS

At the AY/AZ/AN end, the trunk lines connect via new lines to existing pits and piping in each tank farm.

5.3.1 Cross-Site Pipeline Connections

The cross-site pipelines are extended from a diversion point just west of the 244-A lift station to the east side of AP tank farm. The lines are configured identically to the existing cross-site lines with insulation and wire-line leak detection. The lines are installed below grade for approximately 100 m (300 ft) and are then routed on a constructed fill to the east side of AN Farm. Minimum downward slope to the AN Farm is 0.25 percent. Buffalo Avenue and 7th Street will be ramped to pass over the new pipelines. Inside the AN tank farm the lines will be installed at least 1 m (3 ft) below grade to avoid obstructing vehicle traffic.

The high-pressure cross-site line (the line equipped with 1,400 psi booster pump) is routed directly into the 12-in. riser north of the 241-AN-104 pump pit via a welded 3-in. drop leg as shown in Figure 7. Direct routing into the tank eliminates the need for pressure relief valves and rupture discs, and eliminates the risks associated with these relief devices. The low pressure cross-site line is routed into the spare 2-in. nozzle in the AN-01A pump pit, where it connects to the jumper manifold for further routing as shown in Figure 8.

Figure 6. New Jumper Arrangement in AP Valve Pit.

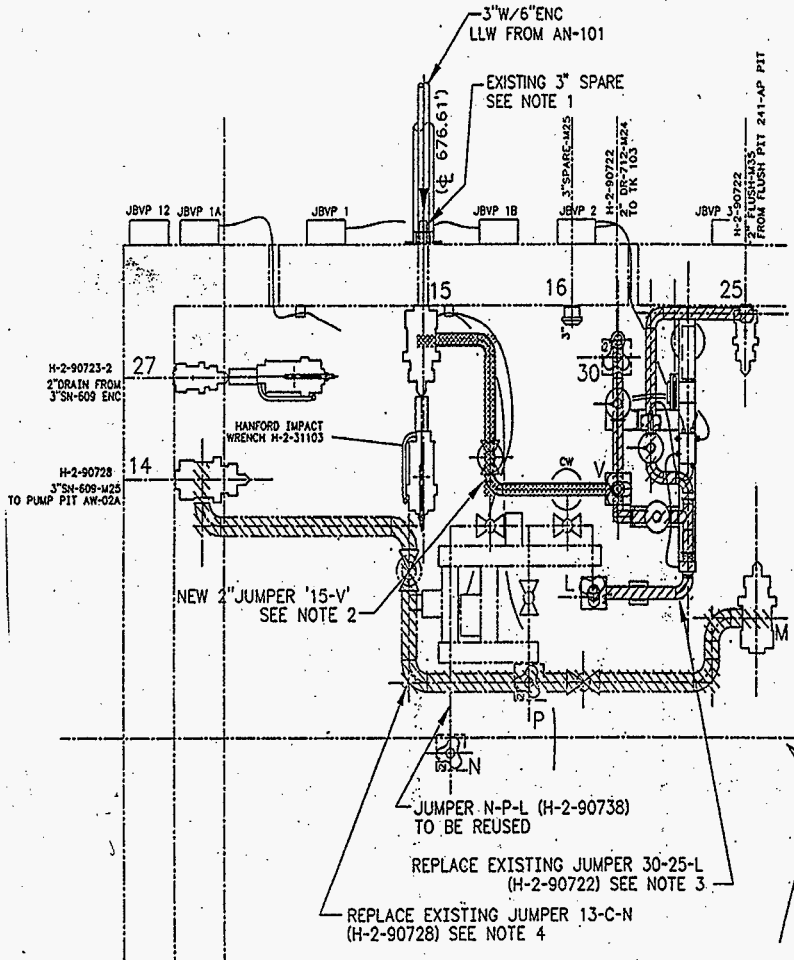


Figure 7. Proposed AN-04D Pit Jumper Layout.

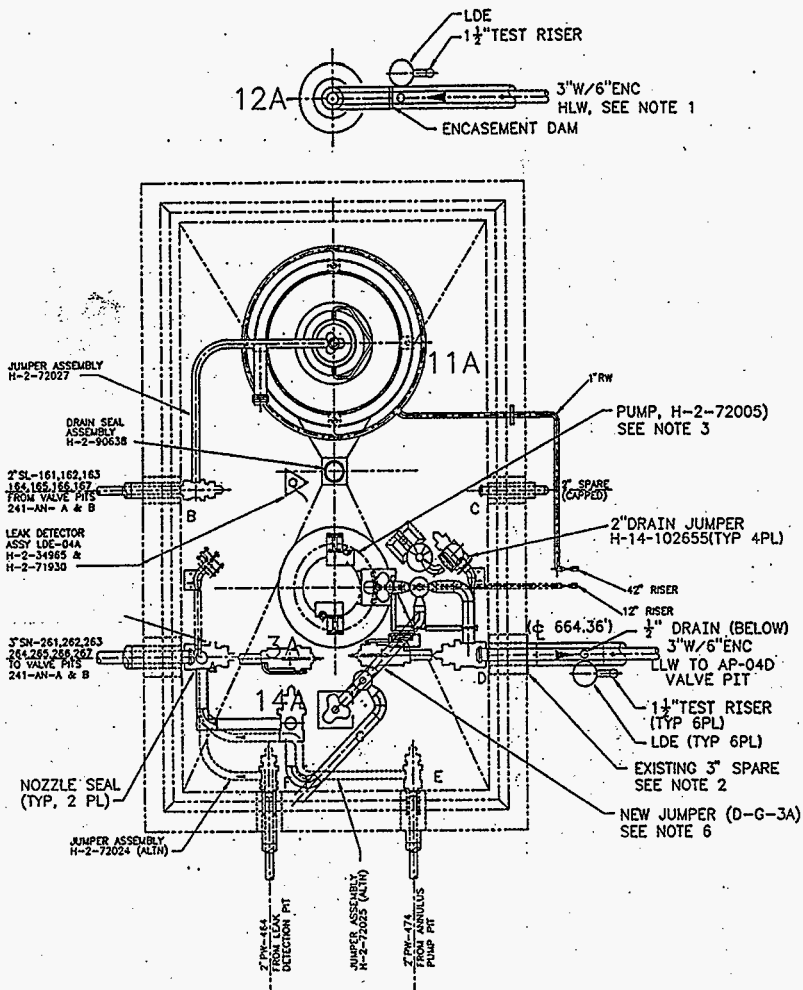
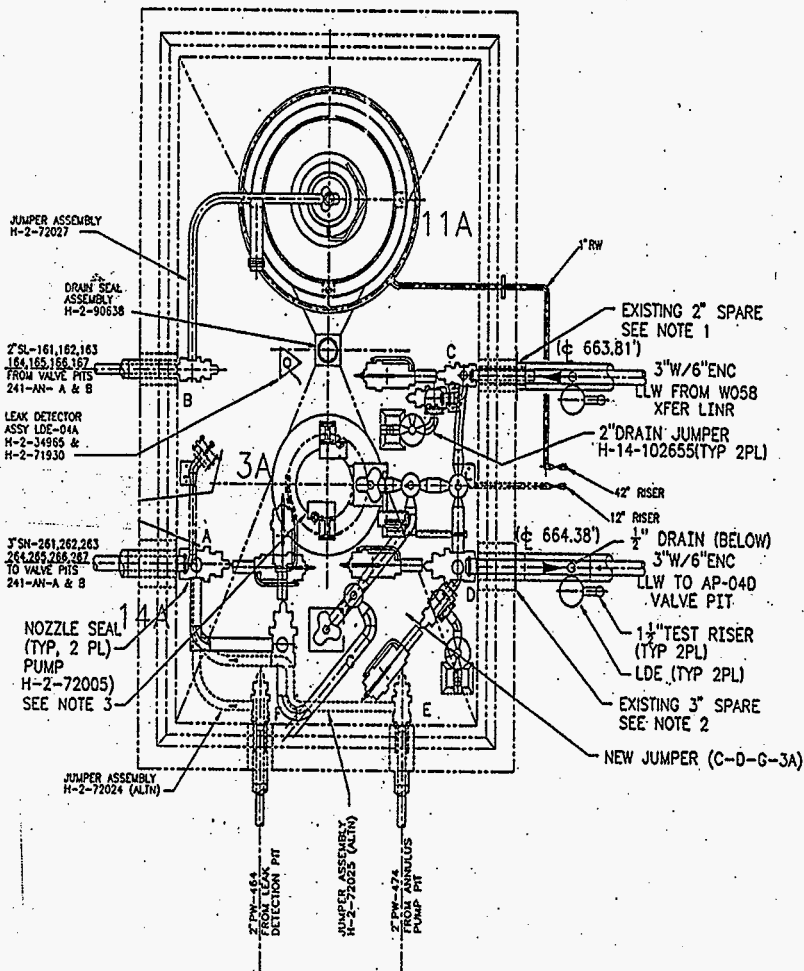


Figure 8. Proposed AN-01A Proposed Jumper Layout.



5.3.2 Privatization High-Level Waste Interface Connections

The line from the Privatization HLW Interface is connected to a proposed new AZ valve pit located outside the east fence of AZ tank farm.

The proposed AZ valve pit is shown in Figure 9. The pit connects to pipelines from tank 241-AN-101, tank 241-AZ-101, and 241-AY-102, as well as lines to the Privatization HLW Interface and the AP valve pit. The new pit is equipped with a drain line to tank 241-AZ-101.

The valved jumper manifolds in the AZ valve pit allow transferring waste from AY and AZ tanks directly to the Privatization HLW Interface, and also allow transfers between any A-complex double-shell tanks.

The line from the Privatization HLW vendor interface point slopes to tank 241-AZ-101, and drains into tank 241-AZ-101. Waste from the AY tanks to the AZ tanks drain into the AZ tank. Waste from the AY tanks to 241-AN-101 or 241-AN-104 drains into the AN tank. Waste routed to other AN tanks will not drain completely, and part of the flush water must be drained back to tank 241-AN-101 or 241-AN-104. Waste from the AY tanks to AP-farm will not drain completely and part of the line flush water must be drained to the AZ or AN tanks.

5.3.3 AP-04D Pit Connections

The line from the AP-04D pit connects directly to the AN-04A pit. The line bypasses the proposed new AZ valve pit to maintain a completely independent transfer routing. The route is sloped from the AP-04D pit to tank 241-AN-104 and drains into tank 241-AN-104. The proposed valving and jumper arrangement in the AN-04A pit is shown in Figure 7.

5.3.4 Connections to the AP Valve Pit

The line from the AP valve pit terminates at the new AZ valve pit and connects via the valved manifold jumper system to lines leading tanks 241-AZ-101, 241-AY-102, and 241-AN-101. The line to tank 241-AN-101 terminates in the AN-01A pump pit. Layout and piping arrangement in the AN-01A pit is shown in Figure 8. In the AN-01A pit valved manifold jumpers connect the line from the AZ valve pit to the following:

- The AN-101 transfer pump
- The AN-B valve pit, allowing connection to the other AN tanks
- The low-pressure cross-site transfer line
- The drain leg into tank 241-AN-101.

5.4 PIPELINE HYDRAULICS

A hydraulic diagram for the proposed pipeline system is attached.

Pipeline Drainage is as follows:

- One line drains from the Privatization interface to an AZ or AN tank
- One line drains from the AP valve pit to an AZ or AN tank
- One line drains from the AP-04D pit to an AN tank.

Lines draining toward AN tanks other than 241-AN-101 or 241-AN-104 have a low point in the AN-01A or AN-04A pump pits, and up to approximately 400 L (100 gal) of liquid (flush water) will not drain and must be drained into tank 241-AN-101 or 241-AN-104 upon completion. When a line is routed to an AY tank, the line will not drain completely and remaining liquid (flush water) must be drained to an AZ or AN tank.

6.0 COST SUMMARY

6.1 W-314 SCOPE RETENTION

Cost estimates prepared for the alternatives evaluated used the recent cost estimate information from Projects W-211 and W-314. Waste transfer system upgrades that were retained from Project W-314 Phase 1 are as follows:

- AN valve pit upgrades
- AW valve pit upgrades (this does not include incorporating Project W-454 scope into W-314)
- AZ tank farm upgrades
- AY tank farm upgrades and
- Master Pump Shutdown (MPS) system.

The above listed work scope still is an integral part of the 200 East Area waste transfer system and is therefore retained.

Only one pipeline segment was retained from the 200 E/W Upgrades for Alternatives 3 and 7. The pipeline that was retained was 3-in. SN-630, 241-AN-B valve pit to 241-AZ-102-02A central pump pit. No pipelines from W-314 Phase 1 E/W Upgrades were retained for Alternative 7B. For a breakdown by Task Element and their associated costs see Table 1, Alternative Cost Summary.

It was the intent of the alternatives evaluated to minimize the amount of in farm construction activities to reduce the overall project cost. The use of "greenfield" construction provides the advantage of being able to Fix Price contract the work and eliminate the need for increased Health Physics Technician (HPT) during construction.

The Alternatives also include the cross-site transfer system reroute into the 241-AN tank farm. This scope of work is not covered by Project W-314 Phase 1 cost estimate but is covered by Phase 2. The conceptual design cost estimate for this task is \$10 million (refer to *244-A Double-Contained Receiver Tank (DCRT) Utilization*, HNF-SD-W314-AGA-006 [Jacobson 1997]).

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6.2 W-211 AND W-314 SCOPE DELETIONS

Table 2 provides a rough order of magnitude cost estimate for tasks/scope that could be eliminated from W-314 Phase 2 scope. The estimate targeted work scope that could be eliminated due eliminating the need to upgrade the existing 200 East Area waste transfer system. The key elements/tasks that were targeted for deletion were: instrumentation for Clean Out Box (leak detection upgrades), AY and AZ sluice pit upgrades, and A-A and AX-A valve pit jumper manifolds/leak detection upgrades. There was no credit taken for the elimination of the cross-site transfer system reroute to 241-AN tank farm. As stated above, the ROM cost for this task is \$10 million.

Table 2. W-314 Phase 2 Cost Reductions.

W-314 Phase 2 scope plus W-211 deletion (Phase 2, post fiscal year 2000)	Estimated cost (millions)
Task Element	
Project Management Phase 2	\$1.4
Permitting and safety Phase 2	\$0.5
Other Project Cost Activities Phase 2	\$1.9
AN Tank Farm	\$0.3
AP Tank Farm	\$0.3
AW Tank Farm	\$0.3
AY Tank Farm	\$3.2
AZ Tank Farm	\$1.1
200 E/W Upgrades	\$25.6
3-in. SN-650 Reroute to 241-AP-104-04D pump pit (W-211)	\$0.7
Total Cost of Deletions	\$34.8

6.3 ALTERNATIVE COST COMPARISON

Table 3 provides a simplified cost comparison for the alternatives evaluated to Project W-314 Phase 1. The cost for each alternative includes an estimated cost for rerouting the cross-site waste transfer system to 241-AN tank farm, this cost is not included in W-314 Phase 1. The estimated cost for rerouting the X-Site for each alternative ranges from \$12.3 million to \$2.7 million. The difference in the cost is attributed to amount of in farm construction activity. For Alternative 3, the amount of in farm construction activity is high due constructing a "New Valve Pit" on AN-103 and routing new lines to the existing AN valve pits and new lines to the AN to AP greenfield pipeline area.

By delaying the rerouting of the cross-site waste transfer system to 241-AN tank farm to Phase 2, as W-314 did, the comparison of cost for equal scope can be made. By delaying the reroute of the cross-site waste transfer system, cost comparison would be as follows:

Alternative 3	\$19.9 million
Alternative 7	\$15.2 million
Alternative 7B	\$12.4 million
W-314 (E/W Transfer System)	\$17.4 million

By making this comparison it can be determined that all of the alternatives provide a cost advantage over the current W-314 waste transfer system upgrade as planned. The advantage to the alternatives also is that increased waste transfer system flexibility is gained since the alternatives provide three new waste transfer line routings. One line will support providing HLW washed sludge to the HLW privatization contractor. One line will provide a route to 241-AP-104-04D pump, therein eliminating the need to reroute SN-650 by Project W-211. The third line to the 241-AP valve pit will support miscellaneous waste transfer from AN, AW, AY, and AZ tank farms to AP tank farm, or vice versa. Alternative 3 still requires the "New Valve Pit" on 241-AN-103 during Phase 1 to provide the same routing capabilities as Alternatives 7 and 7B.

Table 3. Alternative Cost Comparison to W-314.

Alternative 3		Alternative 7		Alternative 7B		W-314 Part 1		
Task Element	Estimated Cost (000)	Task Element	Estimated Cost (000)	Task Element	Estimated Cost (000)	Task Element	Estimated Cost (000)	Cost to Date
AP tank Farm Upgrades	\$1,099	AP tank Farm Upgrades	\$1,097	AP tank Farm Upgrades	\$1,099			
Reroute X-Site to AN-103	\$12,387	Reroute X-Site to AN-101 & 104	\$2,777	Reroute X-Site to AN-101 & 104	\$2,785			
AN-B Valve Pit to AZ-02B Pump Pit	\$2,854	AN-B Valve Pit to AZ-02B Pump Pit	\$2,854					
AN to AP Lines	\$3,411	AN to AP Lines	\$4,807	AN to AP Lines	\$5,515			
AY-102 to AZ-102 Line	\$3,045	AY-102 to AZ-102 Line	\$3,045	AY-102 to New AZ Valve Pit	\$3,169			
AZ-102 to Greenfield	\$1,937	AZ-101 to Greenfield	\$1,941	AZ-101 to New AZ Valve Pit	\$1,809	200 E/W Transfer System	\$17,400	\$1,849
Health Physics Technician	\$1,208	Health Physics Technician	\$941	Health Physics Technician	\$650			
Escalation & Contingency for Engineering (not covered above)	\$712	Escalation & Contingency for Engineering (not covered above)	\$569	Escalation & Contingency for Engineering (not covered above)	\$569			
Sub Total	\$28,864		\$18,932		\$15,796		\$17,400	\$1,849
W-314 Part 1 Task Elements Retained								
MPS (Master Pump Shutdown)	\$14,200	MPS (Master Pump Shutdown)	\$14,200	MPS (Master Pump Shutdown)	\$14,200	MPS (Master Pump Shutdown)	\$14,200	1970
AZ Tank Farm Upgrades	\$6,500	AZ Tank Farm Upgrades	\$6,500	AZ Tank Farm Upgrades	\$6,500	AZ Tank Farm Upgrades	\$6,500	0
AY Tank Farm Upgrades	\$4,852	AY Tank Farm Upgrades	\$4,852	AY Tank Farm Upgrades	\$4,852	AY Tank Farm Upgrades	\$4,852	80
AN Tank Farm upgrades	\$8,314	AN Tank Farm upgrades	\$8,314	AN Tank Farm upgrades	\$8,314	AN Tank Farm upgrades	\$8,314	1675
AW Tank Farm Upgrades	\$3,100	AW Tank Farm Upgrades	\$3,100	AW Tank Farm Upgrades	\$3,100	AW Tank Farm Upgrades	\$3,100	0
Sub Total	\$36,966		\$36,966		\$36,966		\$36,966	\$3,725
Total Estimated Cost	\$63,620		\$54,998		\$52,762		\$54,366	\$5,374

Notes:

- 1) W-314 Part 1 costs do not include the rerouting of the X-Site to the AN tank farm, this is covered by Part 2 at ~\$10,000,000.00
- 2) Estimates do not account for project W-454 scope being added to W-314.

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7.0 REFERENCES

Jacobson, R. W., 1997, *244-A Double-Contained Receiver Tank (DCRT) Utilization*, HNF-SD-W314-AGA-006, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington.

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APPENDIX A

**DESCRIPTION AND EVALUATION
OF ALTERNATIVES**

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APPENDIX A

DESCRIPTION AND EVALUATION OF ALTERNATIVES

The central feature of this piping proposal is the 3-pipeline route from the AZ farm fence line to the Privatization HLW interface, to the AP-04D pit, and to the AP valve pit. This routing is straight forward, and only one option is provided. The tie-in from the AN-AZ-AY-SY tanks to the three lines offers numerous options. Eight options were developed and evaluated for determining the best system from both a technical and cost standpoint. These eight alternatives and their advantages and disadvantages are described in Appendix B. The three alternatives judged to be best were further evaluated with preliminary design drawings and detailed ROM estimates. These Alternatives, labeled 3, 7, and 7B are presented below. Alternative 7B is the preferred alternative.

The three alternatives differ primarily in the extent to which they utilize currently planned Project W-314 pipeline upgrades versus new designs, and to the extent to which they utilize greenfield construction (outside-farm, non-radioactive construction).

ALTERNATIVE 3, 7, AND 7B SUMMARY DESCRIPTION

ALTERNATIVE 3

This Alternative modifies a currently planned new Project W-314 Phase 2 valve pit on tank 241-AN-103 to connect AN, AY, and AZ waste streams to the trunk lines leading to 241-AP-104 and to the AP valve pit. The Privatization HLW interface line is connected directly to tank 241-AZ-102, which is also provided with new lines to the AY tanks and tank 241-AZ-101.

ALTERNATIVE 7

This Alternative utilizes the pump pits on tanks 241-AN-101 and 241-AN-104 to gather up the LAW and miscellaneous wastes into the trunk lines. It connects the AP valve pit trunk line to tank 241-AP-101, and the AP-04D pit line to tank 241-AN-101. The two cross-site lines from SY Farm are routed around AN Farm, with the high pressure line entering the 241-AN-104 tank and the low pressure line leading into the AN-01A pump pit. LAW and wash waste from AY and AZ tanks is routed via the AZ-02A pit to the AN-B valve pit for access to the trunk lines via the AN-01A and AN-04A pits. The HLW trunk line is connected to the AZ-02A pit, which accesses the AZ-01A pit and AY Farm with new connecting lines.

ALTERNATIVE 7B

This Alternative is similar to Alternative 7, except that in lieu of constructing a new line from the AZ-02A pump pit to the AN-B valve pit, it utilizes a new valve pit outside the AZ

Farm east perimeter to route AY and AZ wastes to the proper destination. One line continues to run directly from tank 241-AN-104 to the tank 241-AP-104 04D valve pit. The other two trunk lines terminate in the new valve pit which is connected with new lines to tanks 241-AY-101/241-AY-102, 241-AZ-101/241-AZ-102, and 241-AN-101.

DETAILED DESCRIPTION OF BEST THREE ALTERNATIVES

The proposed transfer system uses a combination of existing pipelines, new pipelines planned by the current Project W-314 design, and new pipelines originated by this proposal.

Features common to all three Alternatives are described first, followed by details specific to the individual alternatives.

FEATURES COMMON TO ALTERNATIVES 3, 7, AND 7B

The following features are common to all Alternatives:

1. The planned W-314 line from the 101-AY central pump pit to the 102-AY central pump pit
2. The planned W-314 line from the 101-AZ central pump pit to the 102-AZ central pump pit
3. A new bypass pipeline around the A-A Valve Pit, connecting lines LIQW 702 to line SN 220. This allows 204-AR transfers to be made directly to AW Farm without upgrading the A-A valve pit. Approximately 20 m (60 ft) of new line would be required. This bypass would allow abandoning the A-A valve pit and eliminate pit and associated leak detector upgrades.
4. Retention of part of the AN-A and AN-B valve pit upgrades, specifically the flush jumpers and part of the transfer jumper manifolds.
5. The main 3-line piping system from the AZ farm east fence line to the AP tank farm connections - the Privatization HLW Interface, the AN-04-B pit, and the AN valve pit.
6. All alternatives delete:

AX-A valve pit upgrades by Project W-314, Phase 2

AX-B valve pit upgrades by Project W-314

A-A valve pit upgrades by Project W-314, Phase 2

A-B valve pit upgrades by Project W-314

Pipeline SN 632 from the AZ-02A pump pit to the AX-B valve pit (W-314)

Pipeline SN 634 from the AX-B valve pit to the A-B valve pit (W-314).

THREE-LINE PIPING SYSTEM FROM AZ FENCE LINE TO AP FARM

The basic pipe proposal provides three new 3-in. encased pipelines from the AN/AZ farm eastern boundary to the AP tank farm as shown in Figure 1. The lines are to be constructed aboveground on a new earthen fill through non-radiological areas.

Pipelines

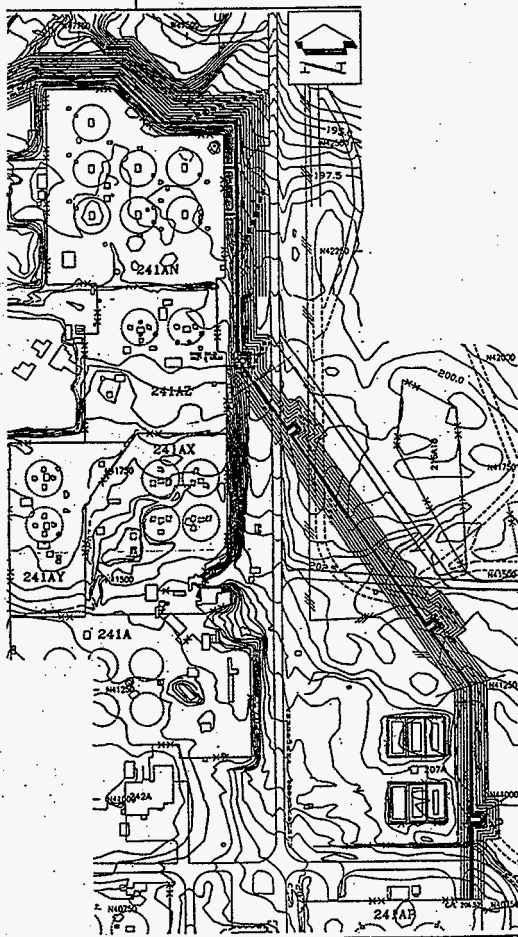
Each line would be built as a 3-in. schedule 40 stainless steel pipe inside a 6-in. carbon steel pipe. Thermal expansion loops are constructed at maximum 200 m (600-ft) intervals. In expansion loops the outer pipe is increased to a 12-in. line. The pipelines will be coated with epoxy and provided with cathodic protection. Alternately, if insulation provides corrosion protection at a lower cost, insulation may be used instead. The lines are bedded in structural backfill and covered with 1 m (3 ft) of earthen fill. General design requirements are identical to those of Project W-314.

The lines are sloped uphill from the AZ Farm fenceline to their AP Farm termination points. Total elevation rise is approximately 23 m (7 ft), and the minimum gradient is 0.25 percent.

Berm Construction -

The pipeline berm leaves the AZ Farm eastern perimeter area near grade level and rises at a minimum grade of 0.25 percent to AP tank farm. The berm layout is shown in Figure 1. The berm crosses Canton Avenue approximately 4 m (12 ft) above grade. The height of the fill gradually decreases to about 2 m (6 ft) just north of the AP tank farm. The fill design is shown in Figure A-1. Bulk fill for berm construction will be hauled by scraper from the grout vault spoil pile located 0.5 miles east of AP farm. Eighty percent of this large spoil pile is available until August of 1999. If the fill haul is delayed beyond this time frame, fill will be hauled from the equidistant submarine trench spoil pile. The fill will be compacted and sloped at 2:1. The earth fill will be hydroseeded for slope stabilization. Gravel or riprap will not be used except where necessitated by close proximity to roadways or structures.

Figure A-1. Fill Design for Berm from AZ Fence Line to AP Farm.



The pipeline berm is located to avoid existing equipment and structures. The backflow preventer cabinet along Canton Avenue east of AZ farm will be protected with a concrete retaining wall. Alternately, it may be relocated approximately 16 m (50 ft) to the north to avoid being buried by the berm. The berm will be constructed between the two manholes on the underground waste water pipeline to the Treated Effluent Disposal Facility (TEDF) to avoid interference with serviceability of this line.

Canton Avenue Termination/Re-routing

Canton Avenue will be blocked by the new pipeline berm. The existing southern section of the roadway will terminate on the south side of the pipeline berm. Canton Avenue will continue to provide access to the A-Farm east gate.

A new perimeter road will be constructed by Project W-519 to serve the new vitrification plants east of the A-complex. The new road will connect to Canton Avenue just north of the pipeline berm, skirting the north side of the berm as shown in Figure 2 and A-1.

AP FARM DISTRIBUTION PIPE LAYOUT

At the AP tank farm the trunk lines terminate in three locations:

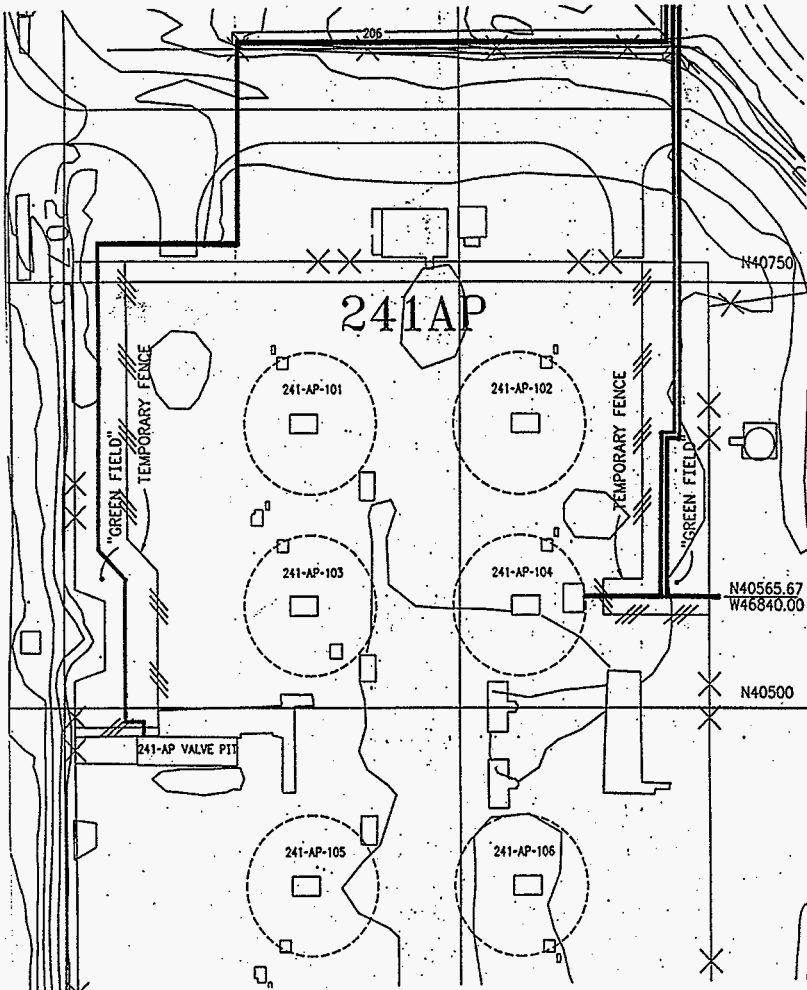
1. Privatization High-Level Waste Interface Point

Two lines enter the AP farm fenced area about 1 m (3 ft) below grade. It is intended to fence off the excavation area in the east side of AP Farm and to perform machine excavation in the clean area.

One line terminates at the Privatization HLW interface point just east of tank 241-AP-104, outside the fence line, as designated by Project W-211 and shown in Figure A-2. The pipeline will be located approximately 1 m (3 ft) below grade at this point, and will terminate with a welded pipe cap. The HLW privatization contractor will be responsible for connecting to the pipe stub at this point.

Project W-211 is providing an additional HLW pipe from the new AP-04D pit to the HLW interface point. This line will be retained to serve as a backup HLW route. The backup routing utilizes the trunk line from the AZ valve pit to the AP valve pit and then routes the HLW stream via the AP-04A pump pit to the AP-04D pit and the connecting line to the HLW interface. The vendor will be responsible for connecting into the two stub pipes at the HLW interface. The Project W-211 jumper design for the AP-04D pit will not need to be modified as it already contains the HLW connection.

Figure A-2. Pipe Routing into 241-AP Tank Farm.



2. AP-04D Pit

One line terminates at a point approximately 3 m (15 ft) east of the proposed new Project W-211 AP-04D pump pit. Connection to the AP-04D pit will be made by Project W-211 to the nozzle currently designated for pipeline SN 650. The currently planned extension of line SN 650 from tank 241-AP-102 to tank 241-AP-104 will be deleted. The planned Project W-211 piping will allow routing waste to either tank 241-AP-102 or to tank 241-AP-104 using new piping and jumpers to be provided by W-211.

3. AP Valve Pit

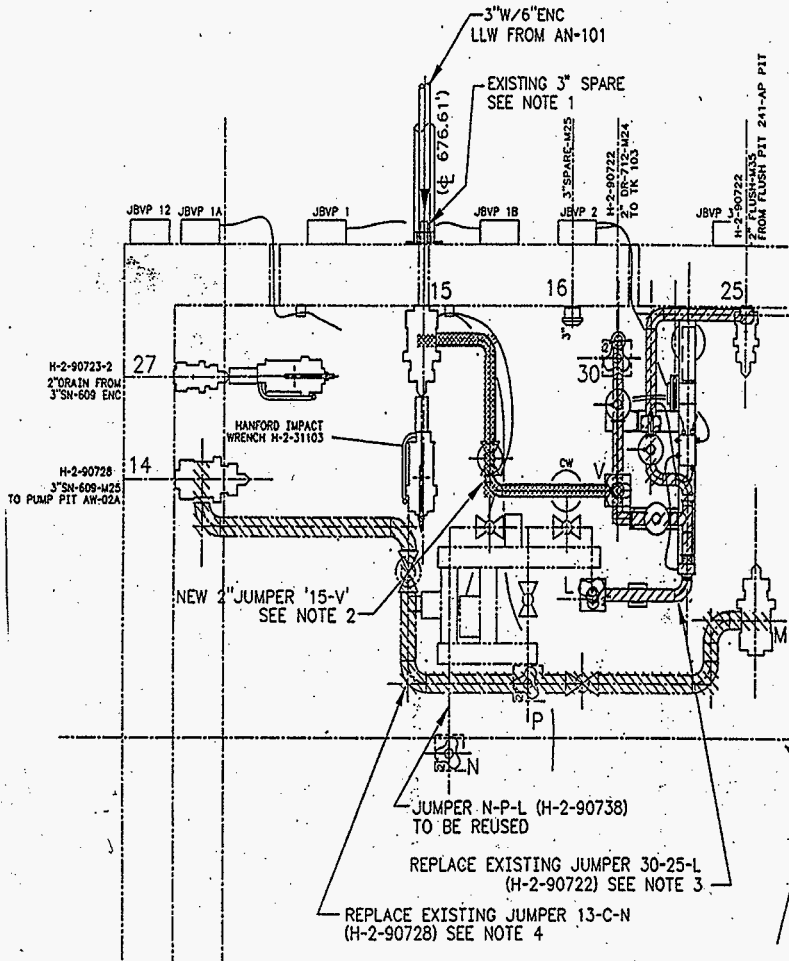
One line will be routed around the north and east sides of the AP tank farm to the AP valve pit, as shown in Figure A-2. The line leaves the main trunk berm just north of 4th Street and then follows 4th Street to the west side of AP Farm. It then enters AP Farm and follows the west fence line about 1 m (3 ft) below grade until it enters the AP Valve Pit. To facilitate pipeline construction, the west side of the AP tank farm will be fenced off as a nonradiological area, and trenching will be performed by machine excavation. Routing the line underground avoids interfering with equipment travel in AP Farm.

The new line will be tied into spare nozzle 15. New jumpers will be provided in the AP valve pit to connect into the existing transfer system as shown in Figure A-3. From the AP valve pit wastes can be routed to or from any AP or AW tank. This connection can also be used as a spare LAW route to tanks 102-AP and 104-AP in the event the primary LAW routing is not available. In addition, HLW can be routed to the vendor interface point as described in Section 5.3.3.

AY-AZ-AN-SY TRUNK LINE CONNECTIONS

At the AY/AZ/AN end the trunk lines connect via new lines to existing pits and piping in each tank farm. Three alternatives for trunk line access were evaluated in detail. Alternative 7B is the preferred alternative.

Figure A-3. New Jumper Arrangement in AP Valve Pit.



ALTERNATIVE 3 FOR AN-AZ-AY-SY CONNECTIONS

Alternative 3 is shown in Figure A-4.

Connection to Privatization HLW Interface

The line from the Privatization HLW Interface is connected to the tank 241-AZ-102 central pump pit AZ-02A. The line runs above ground from the AZ fence line along an existing berm in AN Farm to a point north of tank 241-AZ-102. The line then follows the proposed W-314 SN-630 line into the AZ-02A pump pit via a new pit penetration. Construction on top of tank 241-AZ-102 is expected to be difficult due to numerous interferences and general congestion. In the AZ-02A pit the line is manifolded with valved jumpers to new lines to the AN-B pit, the AZ-01A pit, and the AY-02A pit. Layout of the AZ-02A pit is shown in Figure A-6.

A new above ground line connects the 241-AY-102 central pump pit AY-02A to the AZ-02A pit. In AZ-02A, the line enters the pit via the nozzle currently planned for the SN 632 line. In the AY-02A pit, the new line uses the nozzle planned for line SN 633.

Connections to the AP-04D Pit

The lines from the AP-04D pit and from the AP valve pit are routed to a new valve pit on tank 241-AN-103 that is currently proposed for construction in Phase 2 of Project W-314. The new pit and jumper arrangement are shown in Figure A-5. The new 241-AN-103 valve pit also serves as the new termination point for the cross-site transfer lines extended from the 244-A lift station to AN-Farm. Valved jumper manifolds allow the lines from the AP-Farm to connect to the AN-A and AN-B pits, as well as to the low pressure cross-site transfer line.

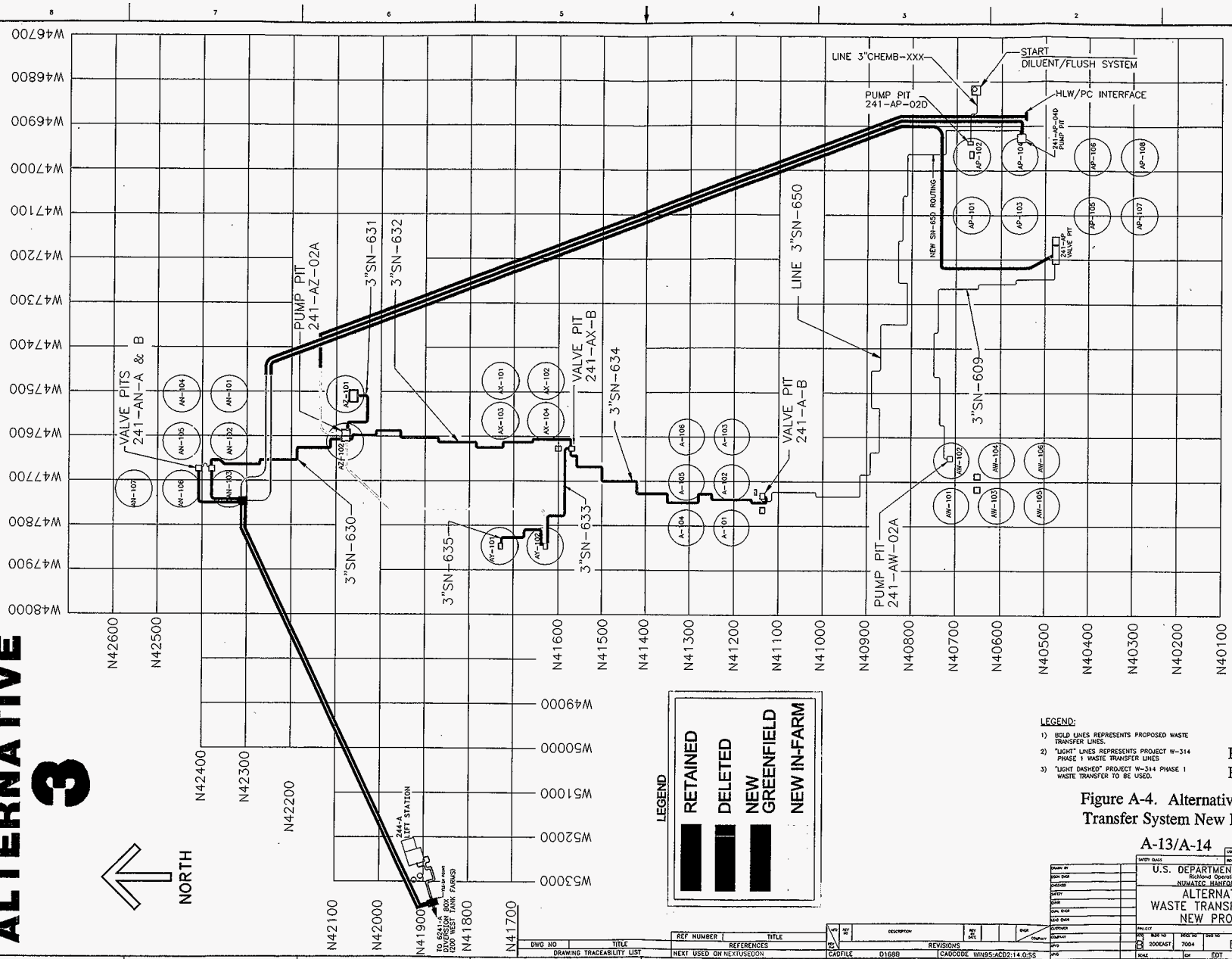
Alternative 3 proposes to eliminate the need for relief valves and rupture discs on the high pressure cross-site line by routing the high pressure line directly into a spare 12-in. riser enclosed by the new pit. The low pressure line is connected to the jumper manifold in the new valve pit. The jumper manifold connects the two AP farm lines, the low pressure cross-site line, and the two new pipelines to the AN-A and AN-B valve pits.

The estimated construction cost for Alternative 3 is \$65.3 million.

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ALTERNATIVE 3



PLAN

LEGEND

	RETAINED
	DELETED
	NEW GREENFIELD
	NEW IN-FARM

- LEGEND:**
- 1) BOLD LINES REPRESENTS PROPOSED WASTE TRANSFER LINES.
 - 2) "LIGHT" LINES REPRESENTS PROJECT W-314 PHASE 1 WASTE TRANSFER LINES.
 - 3) "LIGHT DENSITY" PROJECT W-314 PHASE 1 WASTE TRANSFER TO BE USED.

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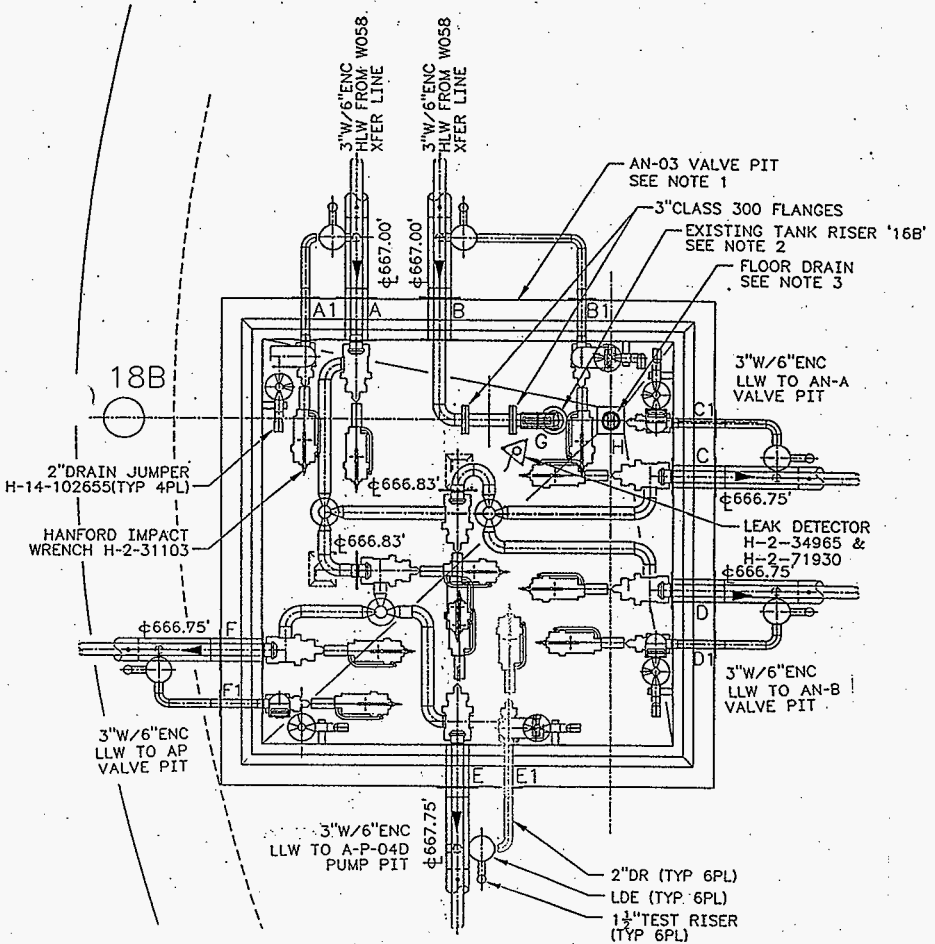
Figure A-4. Alternative 3 Waste Transfer System New Proposed.

A-13/A-14

DATE	BY	CHKD	DATE
U.S. DEPARTMENT OF ENERGY NUCLEAR REGULATORY COMMISSION NUCLEAR MANUFACTURING COMPANY ALTERNATIVE 3 WASTE TRANSFER SYSTEM NEW PROPOSED			
PROJECT	NO. 100	DATE	NO.
0000000000	7004		0
SCALE	DATE	EDT	1 of 1

REF NUMBER	TITLE	DESCRIPTION	DATE	BY	CHKD

Figure A-5. Proposed 241-AN-103 Valve Pit Layout.



ALTERNATIVE 7 FOR AN-AZ-AY-SY CONNECTIONS

Alternative 7 is shown in Figure A-6.

1. Connections to the Privatization High-Level Waste Interface

The pipe routing configuration from the Privatization HLW interface is the same as in Alternative 3.

2. Connection to the AP-04D Pit

This piping layout connects the line from the AP-04D pit to the tank 241-AN-104 central pump pit AN-04A as shown in Figure A-7. In the AN-04A pit the line is manifolded with valved jumpers to the following lines:

- The 104-AP pump discharge
- The existing transfer line to the AN-A valve pit
- A drop leg into tank 241-AN-104.

Waste from the AY/AZ tanks can be routed via the retained SN 630 line from tank 241-AZ-102 to the AN-B and AN-A valve pits, continuing to the connecting point in the AN-04A pump pit.

3. Connections to the AP Valve Pit

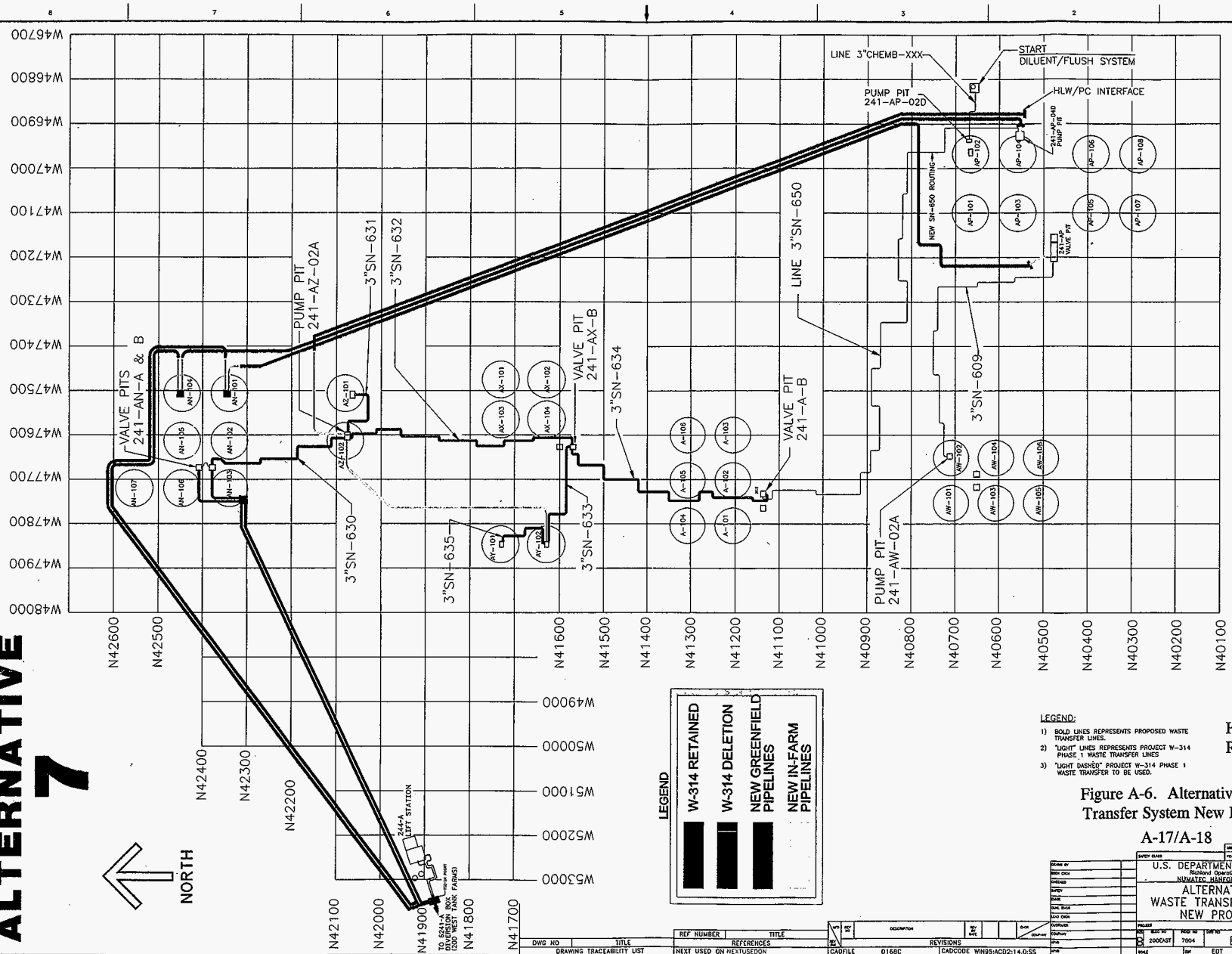
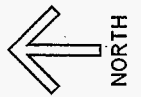
The waste line from the AP valve pit is routed to the 241-AN-101 central pump pit AN-01A as shown in Figure A-8. In the AN-01A pit the line is manifolded with valved jumpers to the following lines:

- The 101-AN pump discharge
- The low pressure cross-site pipeline from SY farm
- The line from the AN-B valve pit.

4. Cross-Site Pipeline Connections

The cross-site pipelines are extended from a diversion point just west of the 244-A lift station to the east side of AP tank farm. The lines are configured identically to the existing cross-site lines with insulation and wire-line leak detection. The lines are installed below grade for approximately 100 m (300 ft) and are then routed on a constructed fill to the east side of AN Farm. Minimum downward slope to the AN Farm is 0.25 percent. Buffalo Avenue and 7th Street will be ramped to pass over the new pipelines. Inside the AN tank farm the lines will be installed at least 1 m (3 ft) below grade to avoid obstructing vehicle traffic.

ALTERNATIVE 7



PLAN

LEGEND

- W-314 RETAINED
- W-314 DELETION
- NEW GREENFIELD PIPELINES
- NEW IN-FARM PIPELINES

- LEGEND:**
- 1) BOLD LINES REPRESENTS PROPOSED WASTE TRANSFER LINES.
 - 2) "LIGHT" LINES REPRESENTS PROJECT W-314 PHASE 1 WASTE TRANSFER LINES
 - 3) "LIGHT DASHED" PROJECT W-314 PHASE 1 WASTE TRANSFER TO BE USED.

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Figure A-6. Alternative 7 Waste Transfer System New Proposed.
A-17/A-18

REV	DATE	DESCRIPTION	BY	CHKD
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REF NUMBER	TITLE	REFERENCES

PROJECT	DATE	SCALE	NO.
W-314	2002/08	7004	D168C

DATE	BY	CHKD	APP'D

Figure A-7. Proposed AN-04D Pit Jumper Layout.

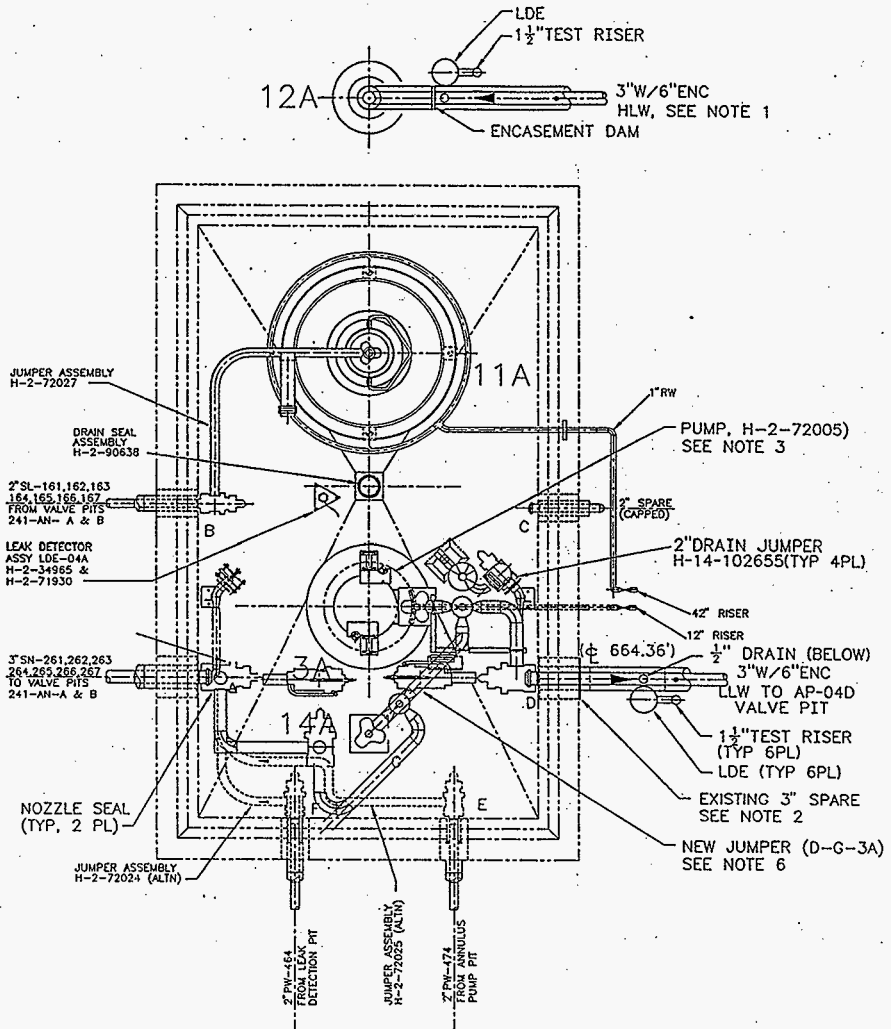
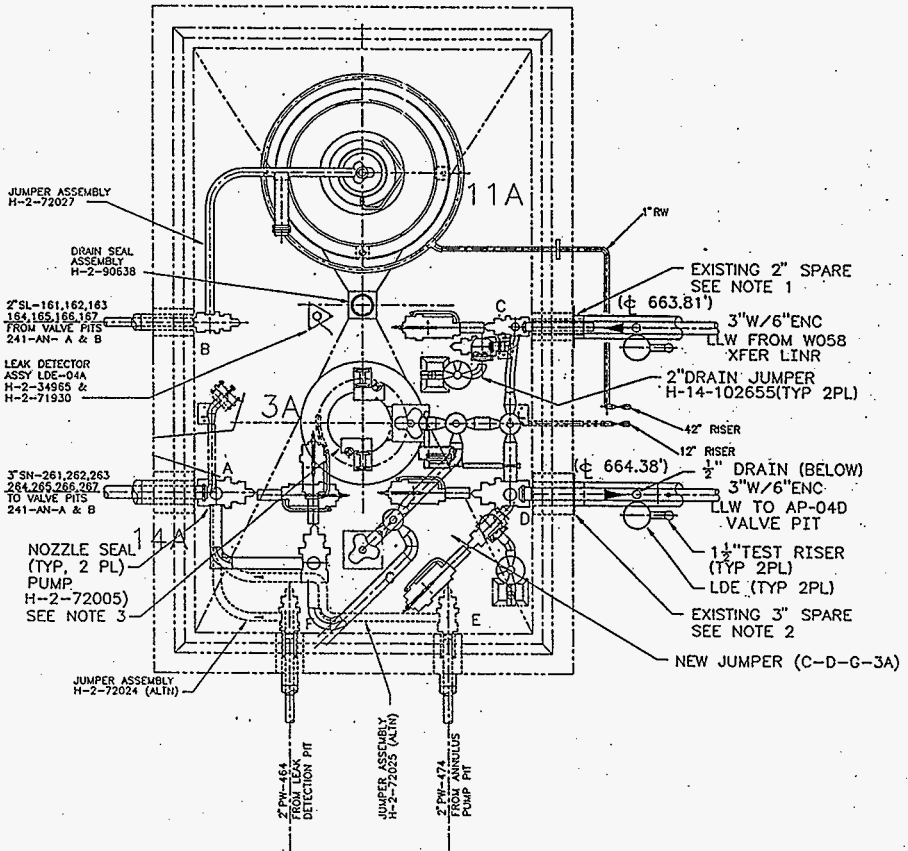


Figure A-8. Proposed AN-01A Proposed Jumper Layout.



The high-pressure cross-site line (the line equipped with 1,400 psi booster pump) is routed directly into the 12-in. riser north of the 241-AN-104 pump pit via a welded 3-in. drop leg. Direct routing into the tank eliminates the need for pressure relief valves and rupture discs, and eliminates the risks associated with these relief devices. The low pressure cross-site line is routed into the spare 2-in. nozzle in the AN-01A pump pit, where it connects to the jumper manifold for further routing as shown in Figure A-7.

The construction cost for Alternative 7 is estimated at \$55.0 million.

ALTERNATIVE 7B FOR AN-AZ-AY-SY CONNECTIONS

Alternative 7B is the Preferred Alternative and is presented in the main body of the Piping System Description. Features are summarized below for comparison with Alternatives 3, 7, and 7B.

The key feature of Alternative 7B is a new valve pit located east of the AZ fence line.

1. Privatization High-Level Waste Interface Connections

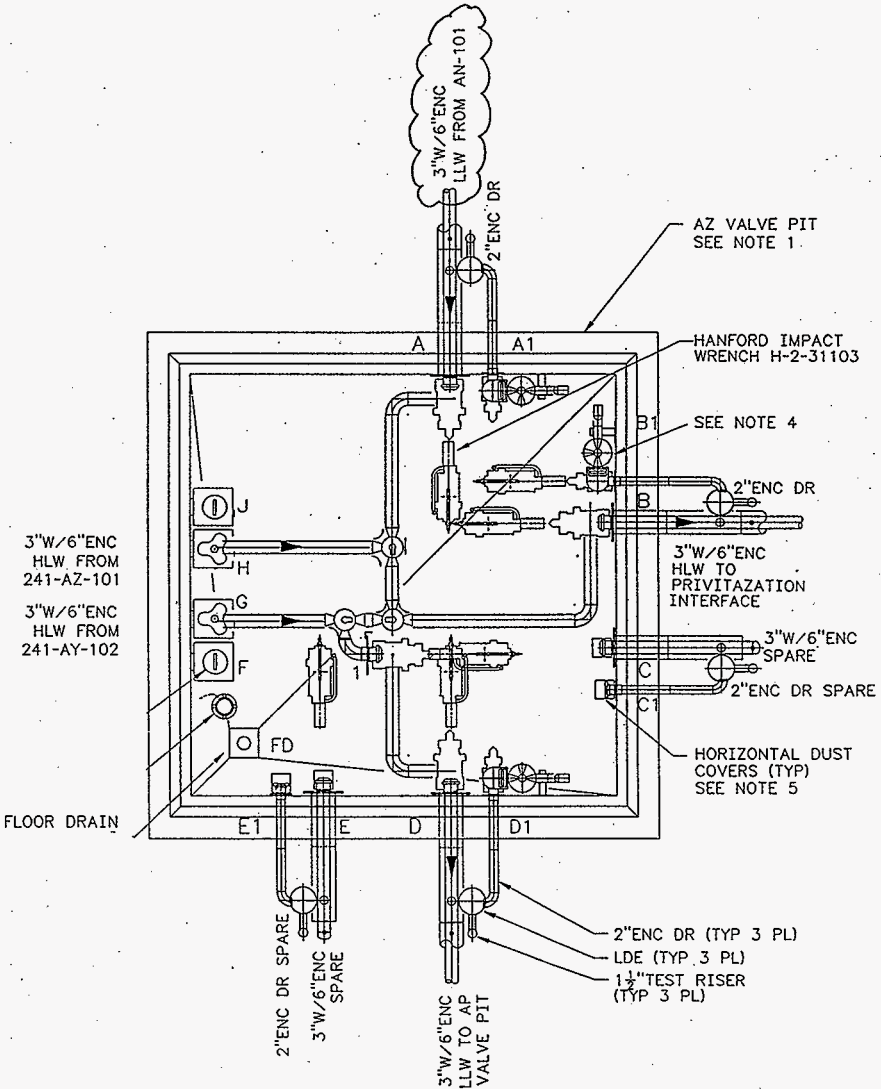
The line from the Privatization HLW Interface is connected to a proposed new AZ valve pit located outside the east fence of AZ tank farm.

The proposed AZ valve pit is shown in Figure A-9. The pit connects to pipelines from tank 241-AN-101, tank 241-AZ-101, and 241-AY-102, as well as lines to the Privatization HLW Interface and the AP valve pit. The new pit is equipped with a drain line to tank 241-AZ-101.

The valved jumper manifolds in the AZ valve pit allow transferring waste from AY and AZ tanks directly to the Privatization HLW Interface, and also allow transfers between any A-complex DSTs.

The line from the Privatization HLW vendor interface point slopes to tank 241-101-AZ, and drains into tank 241-AZ-101. Waste from the AY tanks to the AZ tanks drain into the AZ tank. Waste from the AY tanks to 241-AN-101 or 241-AN-104 drains into the AN tank. Waste routed to other AN tanks will not drain completely, and part of the flush water must be drained back to tank 241-AN-101 or 241-AN-104. Waste from the AY tanks to AP-farm will not drain completely and part of the line flush water must be drained to the AZ or AN tanks.

Figure A-9. Proposed New AZ Valve Pit Layout.



2. AP-04D Pit Connections

The line from the AP-04D pit connects directly to the AN-04A pit. The line bypasses the proposed new AZ valve pit to maintain a completely independent transfer routing. The route is sloped from the AP-04D pit to tank 241-AN-104 and drains into tank 241-AN-104.

3. Connections to the AP Valve Pit

The line from the AP valve pit terminates at the new AZ valve pit and connects via the valved manifold jumper system to lines leading tanks 241-AZ-101, 241-AY-102, and 241-AN-101. The line to tank 241-AN-101 terminates in the AN-01A pump pit. Layout and piping arrangement in the AN-01A pit is shown in Figure A-8. In the AN-01A pit, valved manifold jumpers connect the line from the AZ valve pit to the following:

- The AN-101 transfer pump
- The AN-B valve pit, allowing connection to the other AN tanks
- The low-pressure cross-site transfer line
- The drain leg into tank 241-AN-101.

PIPELINE HYDRAULICS

A hydraulic diagram for Alternative 7B is attached.

Pipeline Drainage is as follows:

- One line drains from the Privatization interface to an AZ or AN tank
- One line drains from the AP valve pit to an AZ or AN tank
- One line drains from the AN-04D pit to tank 241-AN-101.

Lines draining toward AN tanks other than 241-AN-101 or 241-AN-104 have a low point in the AN-01A or AN-04A pump pits, and up to approximately 400 L (100 gal) of liquid will not drain and must be drained into tank AN-101 or AN-104 upon completion. When a line is routed to an AY tank, the line will not drain completely and must be drained to an AZ or AN tank.

The construction cost for Alternative 7B is estimated at \$52.1 million.

ALTERNATIVES 1, 2, 4, 5, 6

Alternatives 1, 2, 4, 5, and 6 utilize two rather than three new pipelines between the AZ-Farm fenceline and AP Farm. They are described in Appendix B. The two-line alternatives were not judged to provide enough advantages to warrant full analysis of design and cost attributes, and only limited detail is provided.

SUMMARY EVALUATION OF EIGHT ALTERNATIVES

Seven alternatives numbered 1 through 7, are presented and evaluated in chart form in Appendix B along with schematics. Alternative 7B is the preferred alternative and is presented in detail in the main report.

Alternatives 1, 2, 4, 5, and 6 feature two lines between the AN-AY-AZ farm complex and the AP-AW farm complex. These alternatives do not provide the redundant capacity and flexibility desirable for a new pipeline system, particularly since a third line can be installed for a relatively small cost increment of roughly 10 percent. The third line uses most of the same berms and excavations as the initial two lines, and employs largely low cost greenfield construction. The 2-line alternatives were eliminated in favor of the 3-line Alternatives 3, 7, and 7B.

Alternative 7B was chosen as the Preferred Alternative on the following basis:

- Lowest cost: \$2 and \$13 million cheaper than Alternatives 7 and 3 respectively.
- Greater flexibility for making simultaneous transfers by making less use of the AN-A and AN-B valve pits. By using the AN-01A and AN-04A pump pits and the new AZ valve pit as pipeline starting points, potential bottlenecks in the AN valve pits are minimized and more simultaneous transfers are possible.
- Projected greater construction schedule reliability by reducing in-farm construction to the lowest fraction of the three alternatives. In-farm construction has traditionally been difficult to schedule reliably because of in-farm obstructions and the negative impacts of radioactive contamination and exposure on work continuity.

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APPENDIX B

WASTE TRANSFER SYSTEM ALTERNATIVES

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APPENDIX B

WASTE TRANSFER SYSTEM ALTERNATIVES

Waste transfer system alternatives to be considered need to address the following issues:

1. Minimize the need for jumper manifolds. This would be accomplished by eliminating process pits.
2. Minimize the need for extensive excavations in the existing tank farms. This would decrease exposure to construction personnel and improve efficiencies of construction.
3. Reduce the number of valves in the waste transfer system.
4. Alternatives need to support current operations:
 - 242-A Evaporator Operation
 - Salt Well Pumping
 - Miscellaneous waste transfers; this includes the 204-AR dilute waste receipt
 - Privatization Phase 1 feed staging requirements.
5. Alternatives need to eliminate low points in the transfer system connecting AN, AY, AW, AZ, and AP tank farms.
6. Improve transfer system availability/reliability.
7. Provide a backup transfer route that will eliminate the need to maintain the current "A farm Complex" waste transfer system from AZ tank farm to the A tank farm valve pits.
8. Provide for MPS control system.
9. Provide for leak detection capabilities to comply with regulatory requirements.

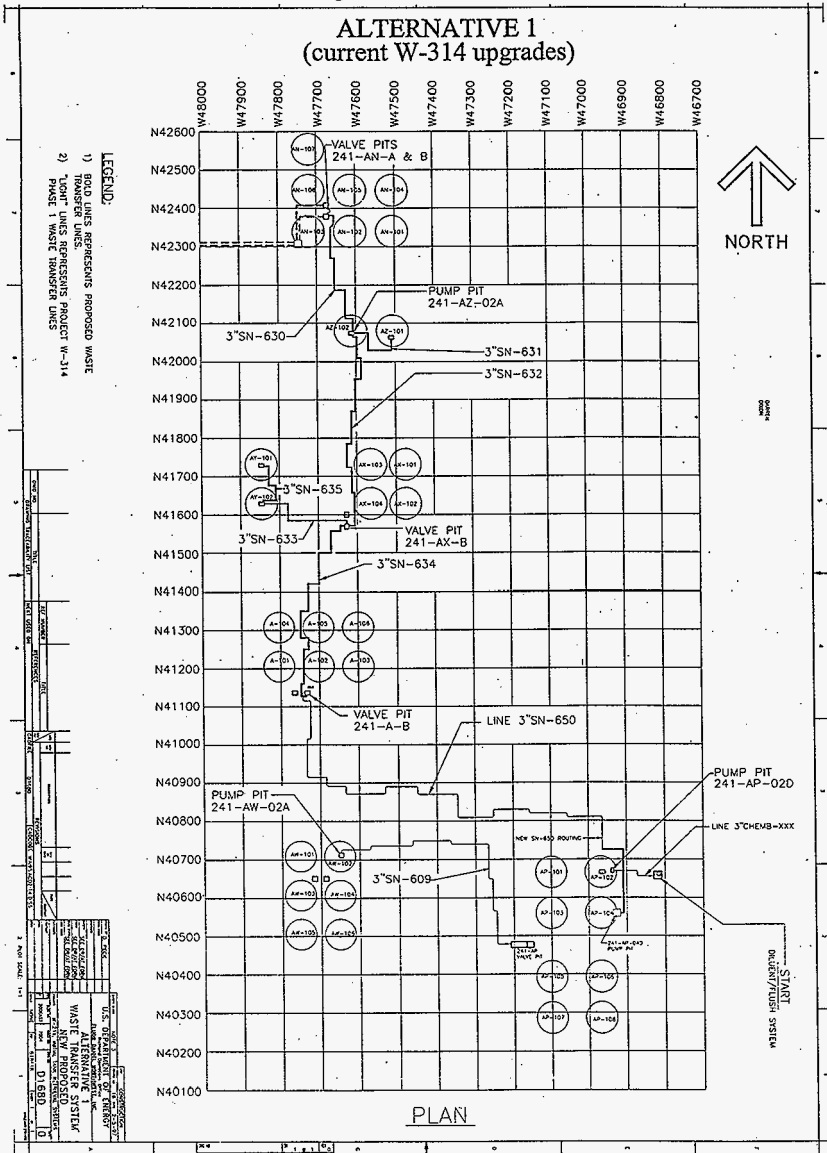
B1.0 ALTERNATIVE 1

Description: Alternative 1 is shown in Figure B-1. Complete W-314 Phase 1 waste transfer system upgrades as scoped. This shall include jumper manifolds and special protective coating (SPC) upgrades in valve pits AN-A and B, AX-A and B, and A-A and B, leak detection system upgrades and MPS system.

W-314 Phase 2 shall proceed with bypassing the 244-A DCRT and route the cross-site transfer system to the AN tank farm. The cross-site reroute is scoped to provide a valve pit at 241-AN-103 and the lines will be routed from this pit to the AN-A and B valve pits.

Pros	Cons
Will not impact current project schedule	Current scope will require excavating through "A Farm Complex;" there will be numerous interferences and some contamination will be encountered. This could impact the project cost and schedule performance.
	80 plus valves would be used. This configuration will present risk of failure and misrouting.

Figure B-1. Alternative 1.



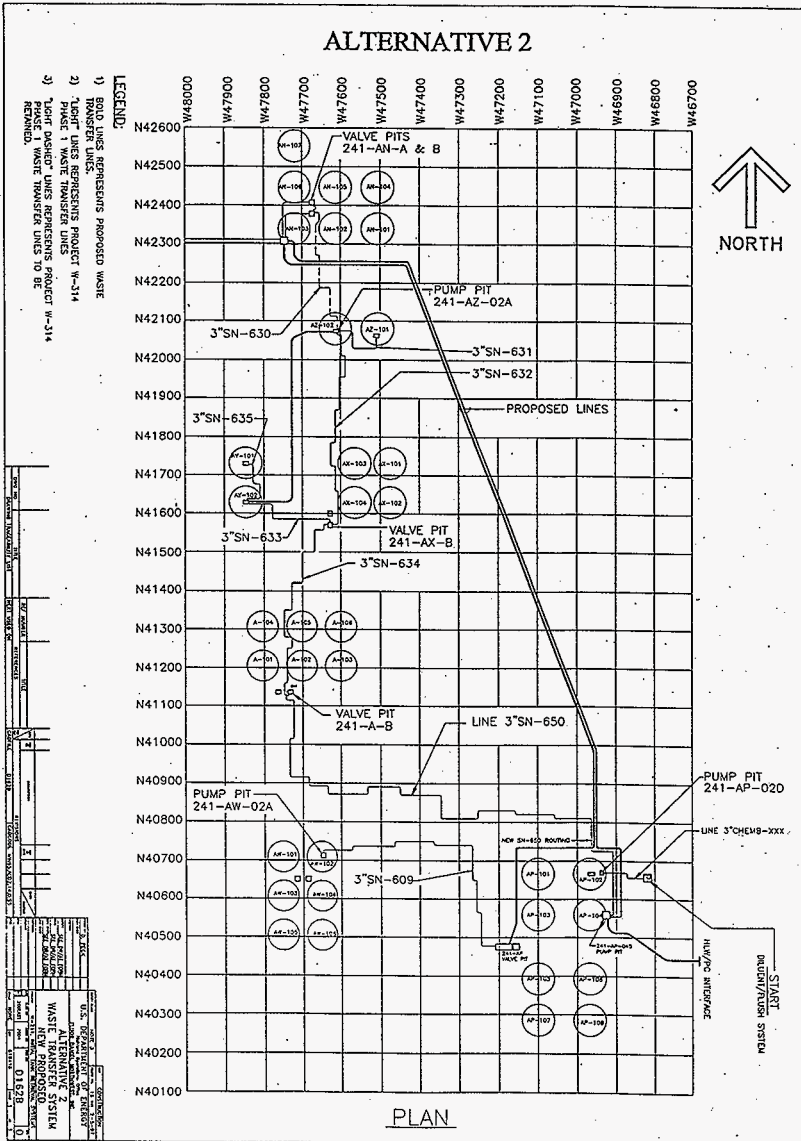
B2.0 ALTERNATIVE 2

Description: Alternative 2 is shown in Figure B-2. This alternative will use the W-314 waste transfer lines connecting AZ tank farm to AN tank farm (line SN-630), 241-AZ-101 to 241-AZ-102 (line SN-631) and 241-AY-101 to 241-AY-102 (line SN-635). Jumper manifold designs for the AN-A and B valve pits would also be retained, some modifications to the design will be required to account for new proposed transfer lines. W-314 transfer line SN-633 will be rerouted from AY-102 -02A to AZ-102-02A pump pits. W-314 transfer lines SN-632 and 634 would be eliminated, as would the need for jumper manifolds in the AX and A valve pits.

Two new supernate (SN) lines will be added to the AN tank farm valve pit(s). These lines will be routed to the AP tank farm. One line will be terminated at the 241-AP-04D-pump/valve pit and the other line will be terminated at the 241-AP Valve Pit. The new line that terminates in 241-AP-04D will support both LAW and HLW feed staging operations, a line stub will be provided for the Privatization Contractor to tie into, as is the current plan for W-211. (Note: An alternate option for connecting to the AN valve pits would be to connect into the "rerouted cross-site transfer lines." This would be accomplished by starting the new proposed lines at the new valve pit provided by W-314 in Phase 2.)

Pros	Cons
Provides simpler route with fewer valves (approximately 40 to 60) than Alternative 1.	HLW and LAW waste will be staged through the same transfer lines, same as Alternative 1.
Cost and schedule time for project execution is expected to be reduced	Alternative configuration may not reduce W-314 Total Project Cost (TPC).
Alternate tie in point would reduce congestion in AN valve pits.	Alternate tie in point will add complexity to the new valve pit on 241-AN-103. Will require routing waste from tank to AN valve pit(s) to 241-AN-103 valve pit and on to AP tank farm.
	241-AN-103 valve pit construction would need to be moved forward; i.e., complete before fiscal year (FY) 2000.

Figure B-2. Alternative 2.

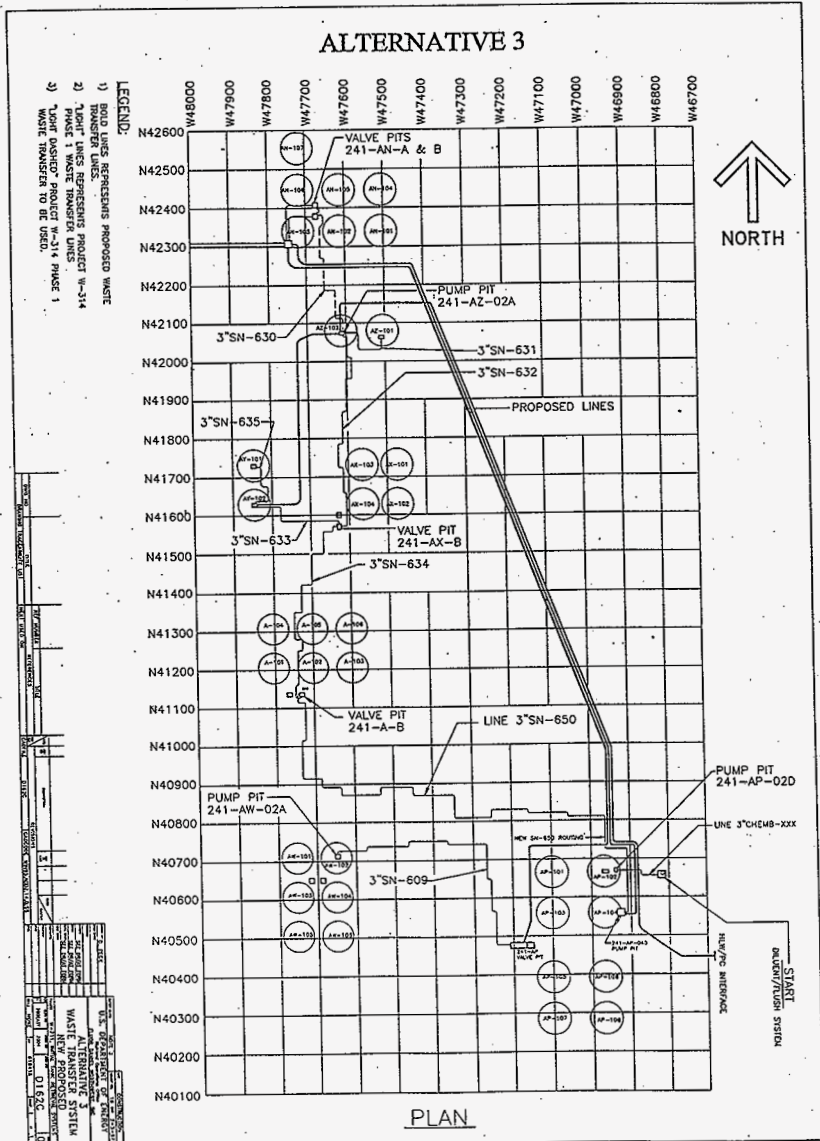


B3.0 ALTERNATIVE 3

Description: Alternative 3 is shown in Figure B-3. This alternative is similar to alternative 2 with the exception that there will be a third line routed from AZ to AP tank farm. This line will be routed from 241-AZ-102-02A central pump pit to location outside the AP tank farm. The termination point will be the interface tie in point for the Private Contractor, which will feed the HLW vitrification facility.

Pros	Cons
Provides independent routes for HLW and LAW transfers.	Alternative configuration may not reduce W-314 Total Project Cost (TPC).
Provides simpler route with fewer valves (approximately 40 to 60) than Alternative 1.	Alternate tie in point will add complexity to the new valve pit on 241-AN-103. Will require routing waste from tank to AN valve pit(s) to 241-AN-103 valve pit and on to AP tank farm.
Cost and schedule time for project execution is expected to be reduced	241-AN-103 valve pit construction would need to be moved forward; i.e., complete before fiscal year (FY) 2000.
Alternate tie in point would reduce congestion in AN valve pits.	

Figure B-3. Alternative 3.



B4.0 ALTERNATIVE 4

Description: Alternative 4 is shown in Figure B-4. Same as Alternative 2 with the exception, that one transfer line will be routed to 241-AP-102-02D pump/valve pit instead of the 241-AP Valve Pit.

Pros	Cons
Provides simpler route with fewer valves (approximately 40 to 60) than Alternative 1.	Will require resetting valves in the AN valve pit(s) when transferring waste to AP.
Cost and schedule time for project execution is expected to be reduced	
Alternate tie in point would reduce congestion in AN valve pits.	
More direct routing for LAW to intermediate feed staging tanks	

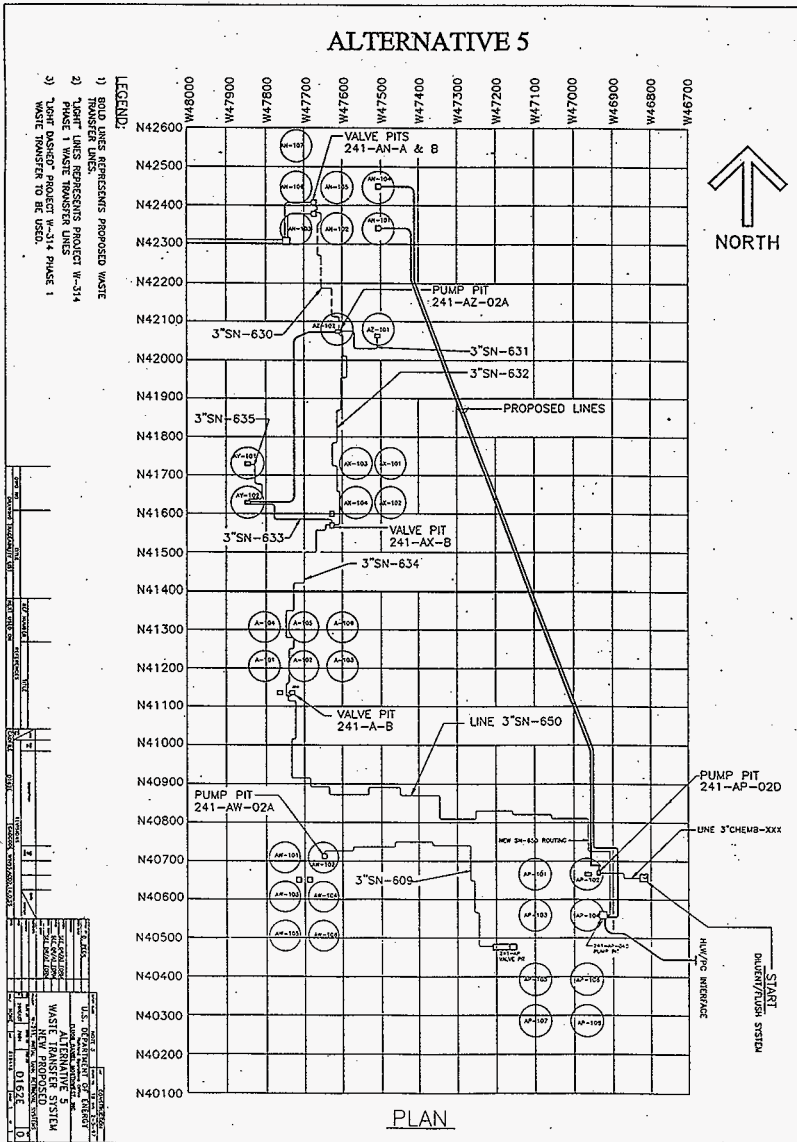
B5.0 ALTERNATIVE 5

Description: Alternative 5 is shown in Figure B-5. This alternative will use the W-314 waste transfer lines connecting AZ tank farm to AN tank farm (line SN-630), 241-AZ-101 to 241-AZ-102 (line SN-631) and 241-AY-101 to 241-AY-102 (line SN-635). Jumper manifold designs for the AN-A and B valve pits would also be retained, some modifications to the design will be required to account for new proposed transfer lines. W-314 transfer line SN-633 will be rerouted from 241-AY-102 -02A to 241-AZ-102-02A pump pits. W-314 transfer lines SN-632 and 634 would be eliminated, as would the need for jumper manifolds in the AX and A valve pits.

Two new supernate (SN) lines will be added, these lines will originate at the central pump pits located on 241-AN-101 and 241-AN-104. The new lines will be routed to the AP tank farm. One line will be terminated at the 241-AP-04D-pump/valve pit and the other line will be terminated at the 241-AP-02D-pump/valve pit. The new line that terminates in 241-AP-04D will support both LAW and HLW feed staging operations, a line stub will be provided for the Privatization Contractor to tie into, as is the current plan for W-211.

Pros	Cons
Further reduction of construction, excavations, in AN for new pipelines.	All transfers to AP would be routed through 241-AN-101 or 241-AN-104.
W-314 jumper manifold designs would not be impacted.	Will require resetting valves in the AN valve pit(s) when transferring waste to AP.

Figure B-5. Alternative 5.

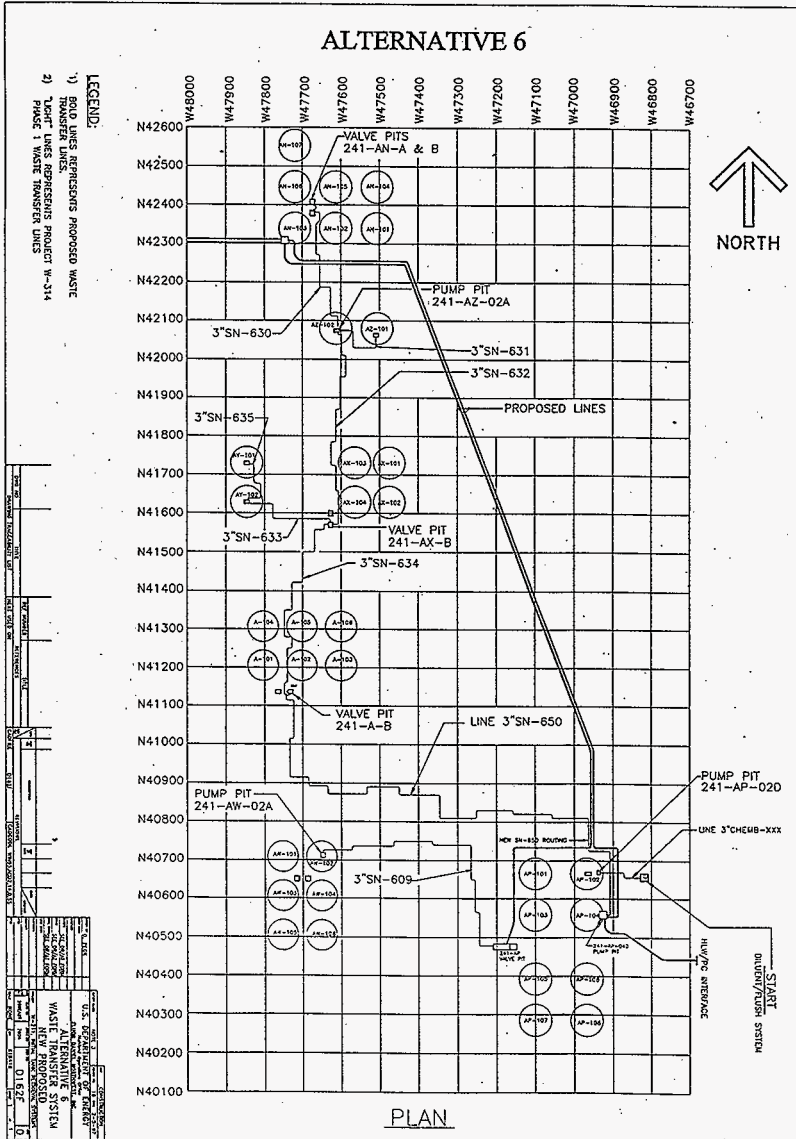


B6.0 ALTERNATIVE 6

Description: Alternative 6 is shown in Figure B-6. This alternative will assume that W-314 is completed as scoped. Two new supernate transfer lines would be added same as Alternative 2 above.

Pros	Cons
Provides spare waste transfer routes to AP tank farm.	Increased construction cost.
	W-314 scope will require excavating through "A Farm Complex;" there will be numerous interferences and some contamination will be encountered. This could impact the project cost and schedule performance.
	80 plus valves would be used. This configuration will present a risk of failure and misrouting.

Figure B-6. Alternative 6.



B7.0 ALTERNATIVE 7

Description: Alternative 7 is shown in Figure B-7. This alternative will use the W-314 waste transfer lines connecting AZ tank farm to AN tank farm (line SN-630), 241-AZ-101 to 241-AZ-102 (line SN-631) and 241-AY-101 to 241-AY-102 (line SN-635). Jumper manifold designs for the AN-A and B valve pits would also be retained, some modifications to the design will be required to account for new proposed transfer lines. W-314 transfer line SN-633 will be rerouted from 241-AY-102 -02A to AZ-102-02A pump pits. W-314 transfer lines SN-632 and 634 would be eliminated, as would the need for jumper manifolds in the AX and A valve pits.

The cross-site transfer lines that are planned to be rerouted to AN tank farm during W-314 Phase 2 will be routed to tanks 241-AN-104 and 241-AN-101. The cross-site lines would be terminated in the respective tank central pump pits. Two new supernate lines would be routed to the AP tank farm, one line to 241-AP-104-04D pump/valve pit and one to 241-AP Valve Pit. A new supernate line would also be provided from 241-AZ-102-02A pump pit to the Privatization Contractors HLW interface tie in point, which is located outside the 241-AP fence line.

Pros	Cons
Minimizes in-farm construction, AN tank farm.	Need to reconfigure the 241-AN-101 and -104 central pump pits.
New "cross-site" transfer system valve pit could be eliminated.	Requires all transfers to AP to be routed through 241-AN-101 or -104.
Would have established two cross-site receiver tanks.	

B8.0 ALTERNATIVE 7B

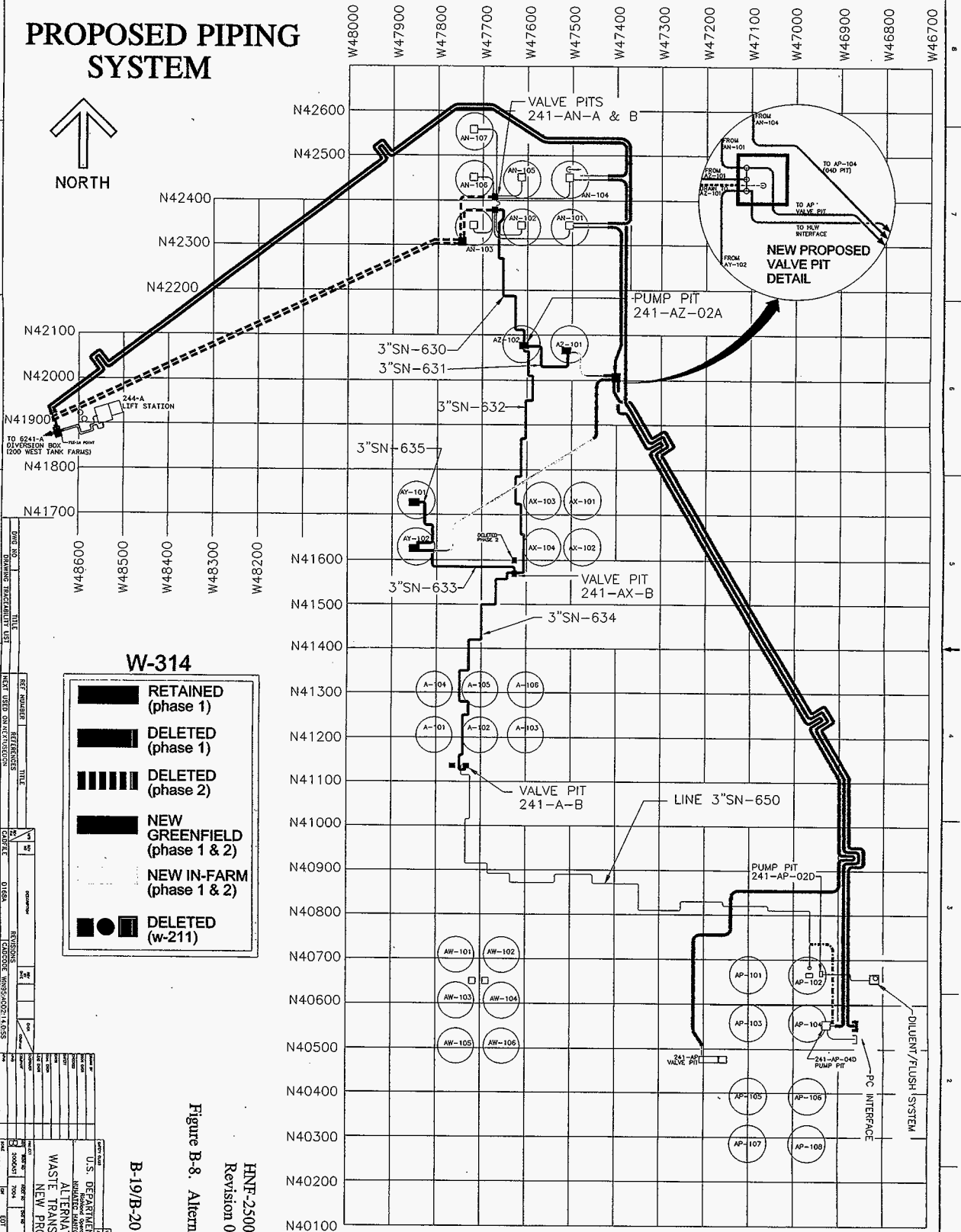
Description: Alternative 7B is the preferred alternative and is shown in Figure B-8. It is described more fully below. This alternative routes the cross-site line to 241-AN-104 (high-pressure line) and to the 241-AN-101 pump pit (low pressure line). One pipeline is routed directly from the 241-AN-101 pump pit to the 241-AP-104 04D pit. Pipelines from tanks 241-AN-101, 241-AZ-101, and 241-AY-101 are routed to a new pump pit east of AZ Farm. Manifold jumps connect these lines to each other and to pipelines routed to the Privatization HLW interface and to the AP valve pit. Part of the AN valve pit upgrades, as well as the lines connecting 241-AZ-101 and 241-AZ-102, and 241-AY-101 and 241-AY-102 are retained from the current Project W-314.

Pros	Cons
Least in-farm construction of alternatives	Requires routing high pressure cross-site wastes into tank 241-AN-104 for re-pumping
Lowest cost of all the alternatives	Need to reconfigure the 241-AN-101 and -104 central pump pits
Provides two cross-site receiver tanks. No relief valves, rupture discs	Requires extending use of existing 2-in. A Complex piping system six months to October 2000
Provides three routes to AP Farm	
Simplifies AN valve pits	

Detailed Description: The proposed pipeline system upgrades the reliability and availability of the waste feed delivery system to the privatization contractors through the application of the following principles:

- Maximizing simplicity by minimizing the number of components in any one transfer route; i.e., fewer valves, jumpers, position switches, leak detectors, motor drives, etc.
- Providing at least two independent trunk transfer routes for any given transfer mission.
- Optimizing operational aspects by providing straight-through routes where feasible and minimizing the impact of valve line-ups and field verifications.

PROPOSED PIPING SYSTEM



W-314

- RETAINED (phase 1)
- DELETED (phase 1)
- DELETED (phase 2)
- NEW GREENFIELD (phase 1 & 2)
- NEW IN-FARM (phase 1 & 2)
- DELETED (w-211)

REV. NO.	DATE	BY	CHKD.	DESCRIPTION
1				ISSUED FOR PERMITTING
2				REVISED PER COMMENTS
3				REVISED PER COMMENTS
4				REVISED PER COMMENTS
5				REVISED PER COMMENTS

U.S. DEPARTMENT OF ENERGY
 NUCLEAR ENERGY ADMINISTRATION
 WASTE TRANSFER SYSTEM
 ALTERNATIVE 7B
 NEW PROPOSED

Figure B-8. Alternative 7B.
 B-19/B-20
 HNF-2500
 Revision 0

PLAN

The proposed piping arrangement is designed to assure that all needed A-Farm Complex double-shell tank (DST) transfers can be made. The system routes waste from the SY tanks to the AN Farm, and is capable of transferring waste from any A-Farm complex DST to any other A-Farm complex DST. The system also maintains the ability to receive waste from the 204-AR unloading facility into AW tank farm.

The Privatization Low-Activity Waste (LAW) and HLW transfers can be made by using no more than 8 valves per transfer, a 75 percent reduction over the currently planned routing.

The central feature of the new system is the set of three lines leading south from the AZ Farm fence line to the AP Farm. Tie-in connections to the AN-AY-AZ complex and to the SY tanks (via the cross-site transfer lines) are provided on the north end. A similar distribution system directs the pipelines on the AP-AW farm end.

B8.1 AN-AZ-AY-(SY) ROUTING TO THE TRANSFER LINE TIE-IN POINT

A system of existing and new pipelines connects to the three transfer lines leading to AP Farm.

B8.1.1 West Area Waste Feed

West Area wastes are transported via the new WT-LL-3150 and -3160 cross-site pipelines to a point just west of the 244-A Lift Station. The tie-in to the 244-A valve pit is removed, and the cross-site lines are extended to AN farm from a point just west of 244-A as shown in Figure B-8. The cross-site lines are routed around the north and east sides of AN Farm to tanks 241-AN-101 and 241-AN-104.

The high pressure cross-site line (the line equipped with a 1,400 psi booster pump) is routed directly into tank 241-AN-101 via a drop leg, eliminating the need for relief valves and rupture discs to protect the existing piping system. From tank 241-AN-104 accumulated wastes can be pumped to any A-Farm complex DST using the 241-AN-104 pump.

The low pressure cross-site line (connected to a low-pressure pump without an installed booster) is connected to a new manifold jumper in the tank 241-AN-101 central pump pit. From the manifold jumper the waste can be routed directly either into tank 241-AN-101 or to any other A-Farm complex DST without entering tank 241-AN-101 under appropriate pumping conditions. This routing also allows dilute A-complex wastes to be pumped from any A-Farm complex DST to SY farm if needed.

B8.1.2 AN Farm Waste Feed

Proposed AN Farm transfer routes are shown in Figure B-8. AN Farm waste can be pumped via multiple routes from any AN-Farm tank to the AP-AW tank farms. One routing is via the AN valve pits and the 241-AN-104 pump pit. From the 241-AN-104 pump pit waste is transferred directly to the AP-04D pit, which serves the Privatization Intermediate Waste Storage Tanks. AN Farm waste can also be pumped to any A-Farm complex tank via the AN valve pits, the 241-AN-101 pump pit, and a new valve pit constructed adjacent to the AZ farm fence. The new pit provides access to the AY and AZ tanks, as well as to the HLW privatization interface and to the AP valve pit.

B8.1.3 AY Farm Waste

Proposed AY Farm transfer routes are shown in Figure B-8. AY Farm wastes can be pumped to any A-Farm complex DST and the Privatization HLW interface via new lines from 241-AY-101 to 241-AY-102 and from 241-AY-102 to the new AZ valve pit. The new AZ valve pit provides continued routings to the Privatization HLW interface, the AP valve pit, and the AZ and AN farms.

B8.1.4 AZ Farm Waste

Proposed AZ Farm transfer routings are shown in Figure B-8. AZ Farm waste feed can be pumped to any A-Farm complex DST and to the Privatization HLW interface via new lines from tank 241-AZ-102 to tank 241-AZ-101, and from tank 241-AZ-101 to the new AZ valve pit. The AZ valve pit provides routings to the Privatization HLW interface, to the AP valve pit, and to the AY and AN farms.

B8.2 THE THREE PIPELINES--AZ FENCELINE TO AP FARM

Three parallel trunk lines are provided from a point just outside the east AZ Farm fence line to AP Farm as shown in Figure B-8. One line originates in the tank 241-AN-104 pump pit. The other two lines originate in the new AZ valve pit. The three lines cross Canton Avenue on a 4-m (12-ft) high berm and skirt the east side of the 207-A retention basin. Two lines continue into AP Farm along the east side fence to the AP-04D pit and to the HLW interface point respectively. The third line turns west and enters AP Farm along the west fence line, terminating in the AP valve pit.

B8.3 AP FARM LINE TERMINATION

In AP farm one line from the AZ valve pit terminates at the privatization contractor HLW interface point east of tank 241-AP-104, using the same interface point as currently identified in Project W-211 documents.

One line from the tank 241-AN-104 central pump terminates in the new Project W-211 04D pit on tank AN-104. Waste can be routed to the Intermediate Waste Feed Staging Tanks 241-AP-102 and 241-AP-104. This line can also be used as an alternate route to the Privatization HLW interface point and to the AP valve pit.

One line is routed from the new AZ valve pit to the AP valve pit for access to the AP or AW tank farms. This line can also be used as an alternate route for transfers to the privatization HLW contractor and for transfers to tanks 241-AP-102 and 241-AP-104.

B8.4 DETAILED DESCRIPTION OF PROPOSED PIPING SYSTEM

The proposed transfer system uses a combination of existing pipelines, new pipelines planned by the current Project W-314 design, and new pipelines originated by this proposal. The central feature of the proposal is a set of three parallel pipelines that connect the AY, AZ, AN, and cross-site systems to the AP system.

The following features are retained from the currently planned Project W-314:

1. The planned W-314 line SN-635 from the 241-AY-101 central pump pit to the 241-AY-102 central pump pit
2. The planned W-314 line SN-631 from the 241-AZ-101 central pump pit to the 241-AZ-102 central pump pit
3. Part of the AN-A and AN-B valve pit upgrades, specifically the flush jumpers and part of the transfer jumper manifolds

The following W-314 features are deleted:

1. AX-A valve pit upgrades by Project W-314, Phase 2
2. AX-B valve pit upgrades by Project W-314
3. A-A valve pit upgrades by Project W-314, Phase 2
4. A-B valve pit upgrades by Project W-314
5. Pipeline SN 632 from the AZ-02A pump pit to the AX-B valve pit (W-314)

6. Pipeline SN 634 from the AX-B valve pit to the A-B valve pit (W-314)
7. Pipeline SN-630 from the AN-B valve pit to the AZ-02-A pump pit
8. Pipeline SN-633 from the AY-02A pump pit to the AX-B valve pit.

B8.4.1 Three-Line Piping System from AZ Fence Line to AP Farm

This pipe proposal provides three new 3-in. encased pipelines from the AN/AZ farm eastern boundary to the AP tank farm as shown in Figure B-8. The lines are to be constructed above ground on a new earthen fill through non-radiological areas.

Pipelines

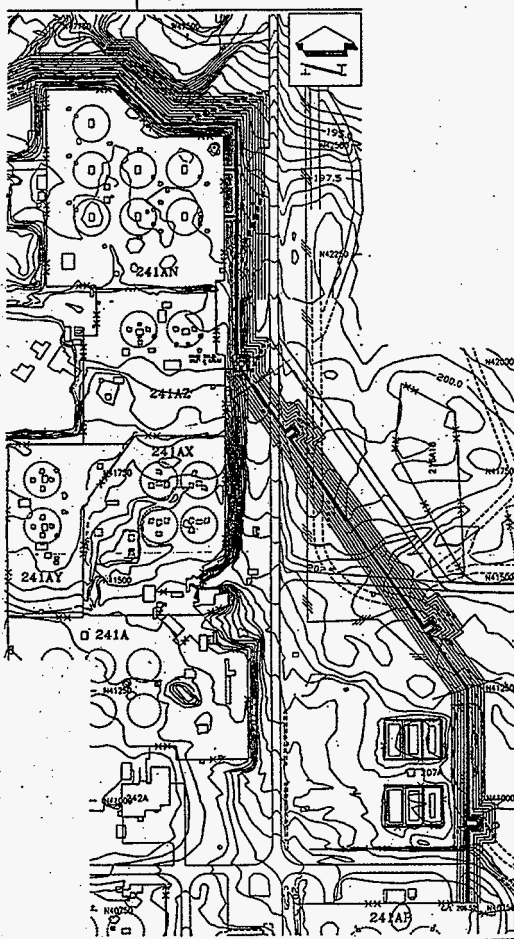
Each line will be built as a 3-in. schedule 40 stainless steel pipe inside a 6-in. carbon steel pipe. Thermal expansion loops are constructed at maximum 200 m (600-ft) intervals. In expansion loops, the outer pipe is increased to a 12-in. line. The pipelines are insulated and are not provided with cathodic protection. The lines are bedded in structural backfill and covered with 1 m (3 ft) of earthen fill. General design requirements are identical to those of Project W-314.

The lines are sloped uphill from the AZ Farm fenceline to their AP Farm termination points. Total elevation rise is approximately 23 m (7 ft), and the minimum gradient is 0.25 percent.

Berm Construction

The pipeline berm leaves the AZ Farm eastern perimeter area near grade level and rises through non-radiological areas at a minimum grade of 0.25 percent to AP tank farm. The berm layout is shown in Figure B-8. The berm crosses Canton Avenue approximately 4 m (12 ft) above grade. The height of the fill gradually decreases to about 2 m (6 ft) just north of the AP tank farm. The fill design is shown in Figure B-9. Bulk fill for berm construction will be hauled by scraper from the grout vault spoil pile located 0.5 miles east of AP farm. Eighty percent of this large spoil pile is available until August of 1999. If the fill haul is delayed beyond this time frame, fill will be hauled from the equidistant submarine trench spoil pile. The fill will be compacted and sloped at 2:1. The earth fill will be hydroseeded for slope stabilization. Gravel or riprap will not be used except where necessitated by close proximity to roadways or structures.

Figure B-9. Fill Design for Berm from AZ Fence Line to AP Farm.



The pipeline berm is located to avoid existing equipment and structures. The backflow preventer cabinet along Canton Avenue east of AZ farm will be protected with a concrete retaining wall. Alternately, it may be relocated approximately 16 m (50 ft) to the north to avoid being buried by the berm. The berm will be constructed between the two manholes on the underground waste water pipeline to the Treated Effluent Disposal Facility (TEDF) to avoid interference with serviceability of this line.

Canton Avenue Termination/ Re-routing

Canton Avenue will be blocked by the new pipeline berm. The existing southern section of the roadway will terminate on the south side of the pipeline berm. Canton Avenue will continue to provide access to the A-Farm east gate.

A new perimeter road will be constructed by Project W-519 to serve the new vitrification plants east of the A-complex. The new road will connect to Canton Avenue just north of the pipeline berm, skirting the north side of the berm as shown in Figure 2 and A-1.

B8.4.2 AP Farm Distribution Pipe Layout

At the AP tank farm the trunk lines terminate in three locations:

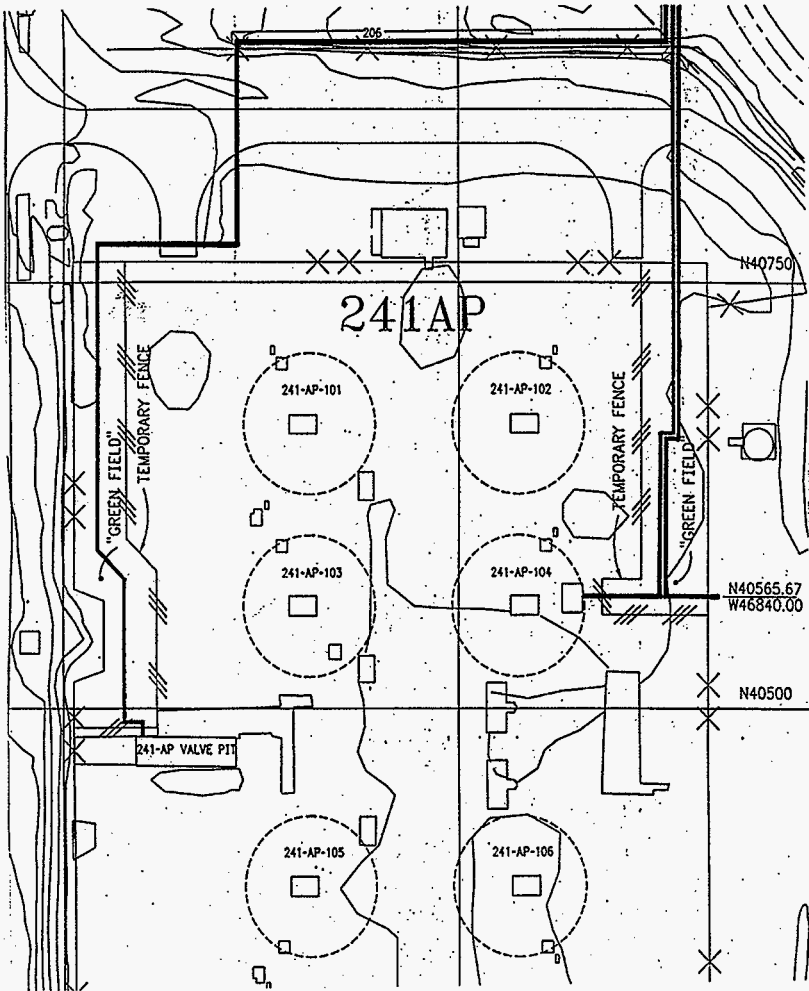
1. Privatization High-level Waste Interface Point

Two lines enter the northeast corner of the AP farm fenced area about 1 m (3 ft) below grade. It is intended to fence off the excavation area in the east side of AP Farm and to perform machine excavation in the clean area.

One line terminates at the Privatization HLW interface point just east of tank 241-AP-104, outside the fence line, as designated by Project W-211 and shown in Figure B-10. The pipeline will be located approximately 1 m (3 ft) below grade at this point, and will terminate with a welded pipe cap. The HLW privatization contractor will be responsible for connecting to the pipe stub at this point.

Project W-211 plans to provide an additional HLW pipe from the new AP-04D pit to the HLW interface point. This line will be retained to serve as a backup HLW route. The backup routing utilizes the trunk line from the AZ valve pit to the AP valve pit and then routes the HLW stream via the AP-04A pump pit to the AP-04D pit and the new connecting line to the HLW interface. The vendor will be responsible for connecting into the two stub pipes at the HLW interface. The Project W-211 jumper design for the AP-04D pit will not need to be modified as it already contains the planned HLW connection.

Figure B-10. Pipe Routing into 241-AP Tank Farm.



2. AP-04D Pit

One line terminates at a point approximately 3 m (15 ft) east of the proposed new Project W-211 AP-04D pump pit as shown in Figure B-10. Connection to the AP-04D pit will be made by Project W-211 to the nozzle currently designated for pipeline SN 650. The currently planned extension of line SN 650 from tank 241-AP-102 to tank 241-AP-104 will be deleted. The planned Project W-211 piping will allow routing waste to either tank 241-AP-102 or to tank 241-AP-104 using new piping and jumpers to be provided by W-211.

3. AP Valve Pit

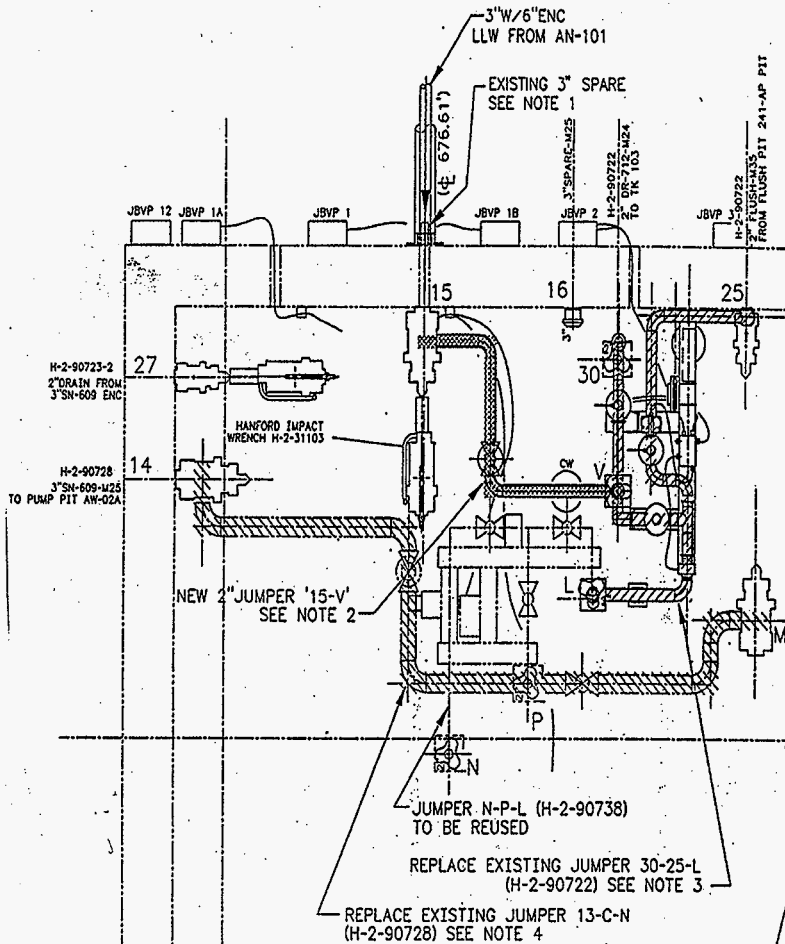
One line will be routed around the north and east sides of the AP tank farm to the AP valve pit, as shown in Figure B-10. The line leaves the main trunk berm just north of 4th Street and then follows 4th Street to the west side of AP Farm. The line crosses under 4th Street and then enters AP Farm and follows the west fence line about 1 m (3 ft) below grade until it enters the AP Valve Pit. To facilitate pipeline construction, the west side of the AP tank farm will be fenced off as a nonradiological area, and trenching will be performed by machine excavation. Routing the line underground avoids interfering with equipment travel in AP Farm.

The new line will be tied into spare nozzle 15. New jumpers will be provided in the AP valve pit to connect into the existing transfer system as shown in Figure B-11. From the AP valve pit wastes can be routed to or from any AP or AW tank. This connection can also be used as a spare LAW route to tanks 241-AP-102 and 241-AP-104 in the event the primary LAW routing is not available. In addition, HLW can be routed to the vendor interface point by utilizing the existing line to the 04A pump pit, and the HLW vendor interface point.

B8.4.3 AY-AZ-AN-SY Trunk Line Connections

At the AY/AZ/AN end the trunk lines connect via new lines to existing pits and piping in each tank farm.

Figure B-11. New Jumper Arrangement in AP Valve Pit.



1. Cross-Site Pipeline Connections

The cross-site pipelines are extended from a diversion point just west of the 244-A lift station to the east side of AP tank farm. The lines are configured identically to the existing cross-site lines with insulation and wire-line leak detection. The lines are installed below grade for approximately 100 m (300 ft) and are then routed on a constructed fill to the east side of AN Farm. Minimum downward slope to the AN Farm is 0.25 percent. Buffalo Avenue and 7th Street will be ramped to pass over the new pipelines. Inside the AN tank farm the lines will be installed at least 1 m (3 ft) below grade to avoid obstructing vehicle traffic.

The high-pressure cross-site line (the line equipped with 1,400 psi booster pump) is routed directly into the 12-in. riser north of the 241-AN-104 pump pit via a welded 3-in. drop leg as shown in Figure B-12. Direct routing into the tank eliminates the need for pressure relief valves and rupture discs, and eliminates the risks associated with these relief devices. The low pressure cross-site line is routed into the spare 2-in. nozzle in the AN-01A pump pit, where it connects to the jumper manifold for further routing as shown in Figure B-13.

2. Privatization High-Level Waste Interface Connections

The line from the Privatization HLW Interface is connected to a proposed new AZ valve pit located outside the east fence of AZ tank farm.

The proposed AZ valve pit is shown in Figure B-14. The pit connects to pipelines from tank 241-AN-101, tank 241-AZ-101, and 241-AY-102, as well as lines to the Privatization HLW Interface and the AP valve pit. The new pit is equipped with a drain line to tank 241-AZ-101.

The valved jumper manifolds in the AZ valve pit allow transferring waste from AY and AZ tanks directly to the Privatization HLW Interface, and also allow transfers between any A-complex double-shell tanks.

The line from the Privatization HLW vendor interface point slopes to tank 241-101-AZ, and drains into tank 241-AZ-101. Waste from the AY tanks to the AZ tanks drain into the AZ tank. Waste from the AY tanks to 241-AN-101 or 241-AN-104 drains into the AN tank. Waste routed to other AN tanks will not drain completely, and part of the flush water must be drained back to tank 241-AN-101 or 241-AN-104. Waste from the AY tanks to AP-farm will not drain completely and part of the line flush water must be drained to the AZ or AN tanks.

Figure B-12: Proposed AN-04D Pit Jumper Layout.

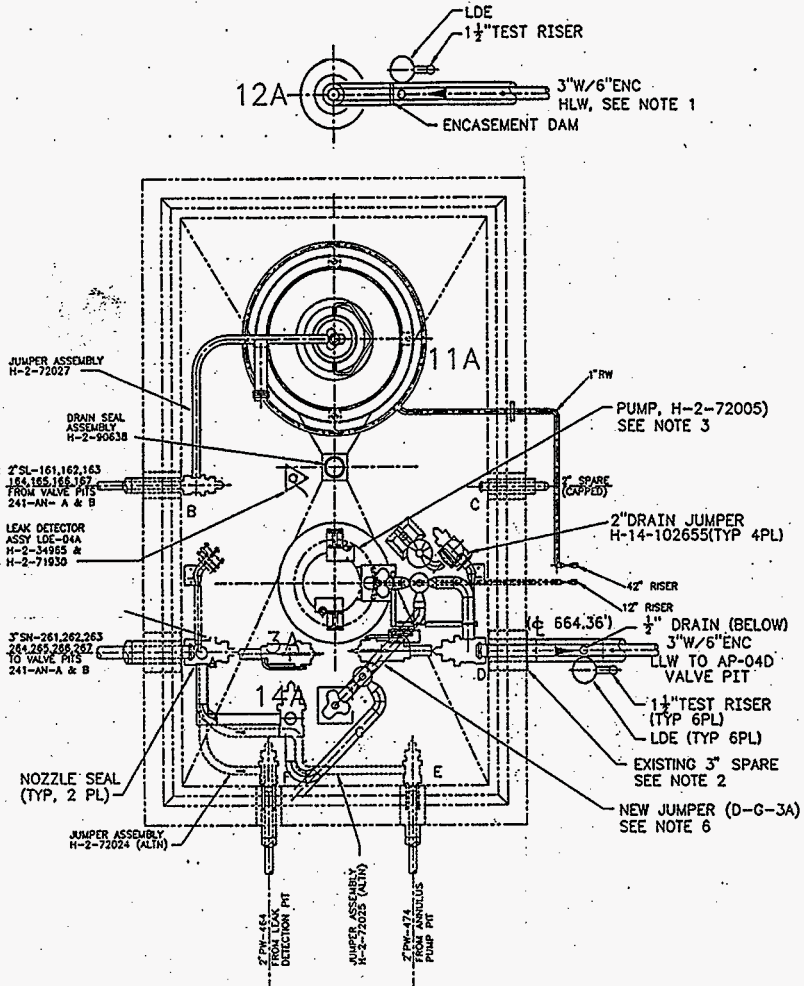


Figure B-13. Proposed AN-01A Proposed Jumper Layout.

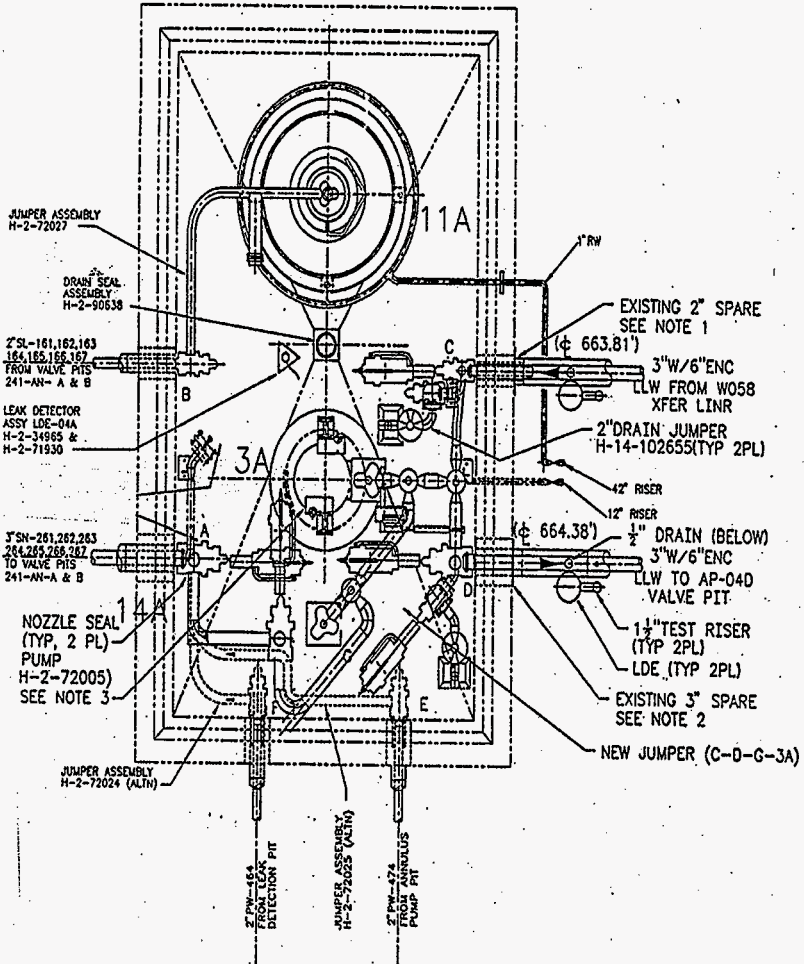
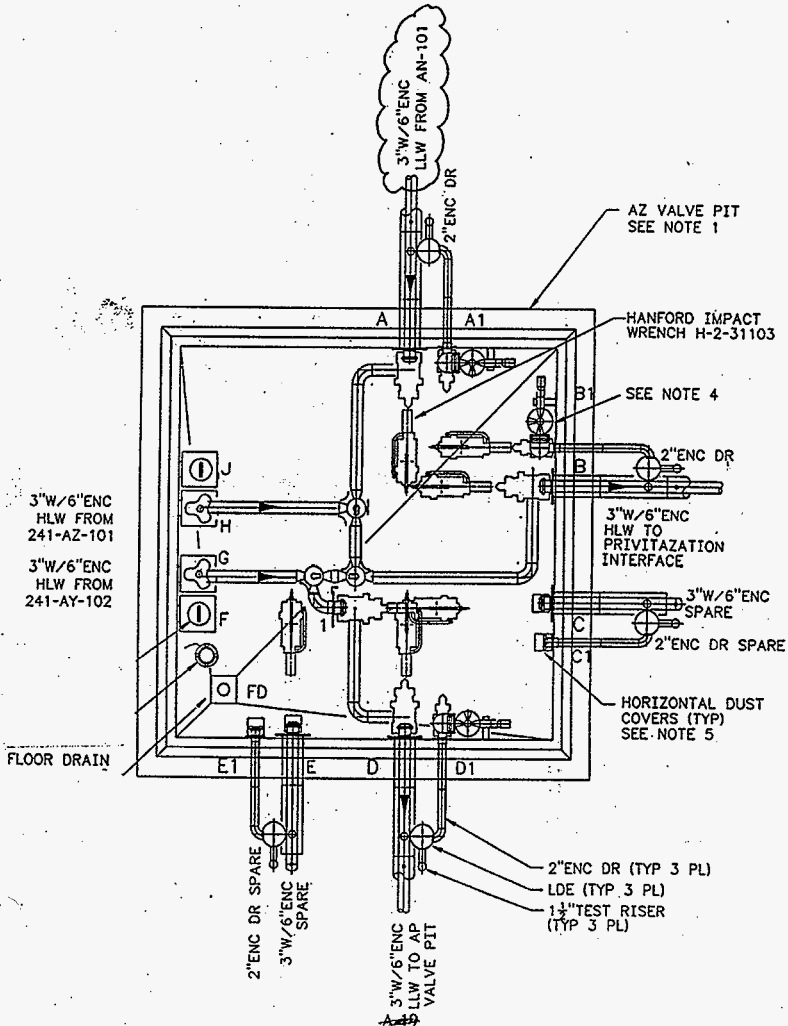


Figure B-14. Proposed New AZ Valve Pit Layout.



3. AP-04D Pit Connections

The line from the AP-04D pit connects directly to the AN-04A pit. The line bypasses the proposed new AZ valve pit to maintain a completely independent transfer routing. The route is sloped from the AP-04D pit to tank 241-AN-104 and drains into tank 241-AN-104. The proposed valving and jumper arrangement in the AN-04A pit is shown in Figure B-1.

4. Connections to the AP Valve Pit

The line from the AP valve pit terminates at the new AZ valve pit and connects via the valved manifold jumper system to lines leading tanks 241-AZ-101, 241-AY-102, and 241-AN-101. The line to tank 241-AN-101 terminates in the AN-01A pump pit. Layout and piping arrangement in the AN-01A pit is shown in Figure B-2. In the AN-01A pit valved manifold jumpers connect the line from the AZ valve pit to the following:

- The AN-101 transfer pump
- The AN-B valve pit, allowing connection to the other AN tanks
- The low-pressure cross-site transfer line
- The drain leg into tank 241-AN-101.

B8.4.4 Pipeline Hydraulics

A hydraulic diagram for the proposed pipeline system is attached.

Pipeline Drainage is as follows:

- One line drains from the Privatization interface to an AZ or AN tank
- One line drains from the AP valve pit to an AZ or AN tank
- One line drains from the AP-04D pit to an AN tank.

Lines draining toward AN tanks other than 241-AN-101 or 241-AN-104 have a low point in the AN-01A or AN-04A pump pits, and up to approximately 400 L (100 gal) of liquid (flush water) will not drain and must be drained into tank 241-AN-101 or 241-AN-104 upon completion. When a line is routed to an AY tank, the line will not drain completely and remaining liquid (flush water) must be drained to an AZ or AN tank.

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APPENDIX C

**PROPOSED PROJECT RETENTIONS,
DELETIONS, AND ADDITIONS
--PROJECT W-314**

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APPENDIX C

**PROPOSED PROJECT RETENTIONS,
DELETIONS, AND ADDITIONS
--PROJECT W-314**

1.0 SCOPE DELETION

The following items are proposed for deletion:

New Line SN-632 /241-AZ-02A to AX-B valve pit

New Line SN-633/241-AY-02A to AX-B valve pit

New Line SN-634/AX-B valve pit to A-B valve pit

AX-B valve pit jumper manifolds (Phase 1)

AX-A valve pit jumper manifolds (Phase 2)

A-B valve pit jumper manifolds (Phase 1)

A-A valve pit jumper manifolds (Phase 2)

New Line SN-630/241-AN-B valve pit to AZ-02A pump pit

Part of AZ-02A pump pit modifications, including line SN-630 and SN-632 tie-in, and part of AZ-02A jumper manifolds (Project W-211)

MPS upgrades to pits and lines that are not used in the proposed system and that are identified above as deletions.

Leak detection system upgrades for the existing slurry and supernate lines and associated cleanout boxes. This will also affect the MPS System upgrades (Phase 2).

2.0 SCOPE RETENTION

The following items are proposed for retention:

New Line/SN-631 -- AZ-02A pump pit to AZ-01A pump pit

New Line/SN-635 -- AY-02A pump pit to AY-01A pump pit

Jumper Manifolds for AN-A and B valve pits (approximately 50 percent)

Leak Detection upgrades in AN valve pits

Leak Detection upgrades in AY and AZ central pump pits

Use of existing lines in AN tank farm for dilution and flushing requirements support.

New Jumpers in 241-AY-101 and 241-AY-102 central pump pits.

3.0 SCOPE ADDITION

The following items are proposed for addition:

GREENFIELD (OUTSIDE TANK FARMS) CONSTRUCTION

Three new lines from AN-Farm SE fence line to AP farm NE fence line (outside-farm construction). New lines will be constructed on an earthen ramp constructed from the east boundary of the AN/AZ Tank Farm Complex to AP tank farm.

Canton Avenue Modifications--Canton Avenue will terminate south of the new pipeline earthen ramp/berm. The northern portion of Canton Avenue will connect into the proposed new perimeter road to be constructed by W-519/Privatization Infrastructure.

Reroute of the newly constructed cross-site waste transfer line to bypass the 244-A DCRT. Two lines will be routed up to the AN tank farm fence NW corner. The AN farm plateau will be extended as required to support the rerouting of the Cross-site Transfer Line to the 241-AN-101 and 241-AN-104 tanks. This plateau extension will intersect the earthen ramp being constructed on the eastern boundary of the AN/AZ Farm Complex.

Construct new valve pit east of 241-AZ-101. Route a new line from the AZ-01A pump pit (starting at the AZ farm fence boundary) to the new valve pit. Also routed into the new valve pit are: one line from the AY-02A pump pit (at AZ fence boundary), and one line from

AN-01A pump pit (at the AN fence boundary). Two new lines will be routed out of the AZ valve pit to AP tank farm; refer to paragraph (a) above. Scope includes new jumpers in new AZ valve pit.

IN-FARM CONSTRUCTION

- (a) 1 new line from AP-farm NE fence line to AP-04D pump pit
- (b) 1 new line from AP-farm NW fence line to AP valve pit
- (c) 1 new line from AP-farm NW fence line to HLW interface point.

4 new lines from the AN farm eastern fence line to the following points

- (a) 12-in. riser north of 241-AN-104 central pump pit
- (b) spare 3-in. nozzle in 241-AN-104 central pump pit
- (c) spare 3-in. nozzle in 241-AN-101 central pump pit
- (d) spare 2-in. nozzle in 241-AN-101 central pump pit

1 new line AN/AZ Farm Complex east fence boundary to AZ-01A pump pit

1 new aboveground line from AY-102-02A central pump pit to AZ farm east fence line.

ALTERNATIVE 3 AND 7

1 new line AZ-02A pump pit to AY-02A pump pit.

Install new jumpers in the following pits: 241-AN-101 and 241-AN-104 central pump pits.

New jumpers in the 241-AP valve pit.

Reroute line LIQW-702 around valve pit A-A and tie into SN-220.


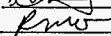
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APPENDIX D

**PRESSURE DROP CALCULATIONS
FOR NEW TRANSFER LINE**

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Prepared by:  3/2/98
Checked by:  3/2/98

Pressure Drop Calculation for proposed new transfer line

1.0 INTRODUCTION

This calculation is an estimate of pumping performance of the new Sulzer Bingham¹ pumps (to be installed under Project W-211) for transfers along the proposed new direct line from the AN Tank Farm to the AP Tank Farm. The objective of this calculation is to develop curves showing the estimated operating performance of the new Sulzer Bingham pump using the proposed new line. This evaluation is currently limited to a single route from AN-104 to AP-104 using the new line proposed in alternative 7. The equivalent length of the line from AN-104 to AP-104 is approximately 2500 ft. Additionally, 50 ft of head loss was added to account for the hydraulic differences between the bottom of the AN-104 and the discharge in AP-104. Curves were also developed for equivalent line lengths from one to five thousand feet. These curves can be used to estimate the performance of the Sulzer Bingham pumps in other routes in the tank farms. As in the specific transfer from AN-104 to AP-104, 50 ft of head loss is added to each line length to account for hydraulic differences.

2.0 INPUTS AND ASSUMPTIONS

The following inputs and assumptions were used in this evaluation.

- All transfer pipe is to be 3" schedule 40 pipe, inside diameter of 3.068 inches.
- Density and viscosity data is not yet available for AN-104, therefore, density and viscosity data from AN-105 was used (*Results of Dilution Studies with Waste from Tank 241-AN-105*, HNF-SD-WM-DTR-046, Rev. 0, Herting 1997). The following three densities were used:
 - ▶ 1.28 g/ml, 1.34 g/ml, and 1.42 g/ml

Viscosities of 5, 10, 15, 20, and 30 were evaluated at each of the densities.

- The attached pump curve was used to evaluate the capabilities of the pump. A number of points on the pump curve (at 3600 RPM) from 90 to 190 gallons per minute were plotted. The curve was then extrapolated to 230 gallons per minute.
- The sending and receiving tanks are at atmospheric pressure.
- The hydraulic head loss from the bottom of Tank 241-AN-104 to the discharge point on Tank 241-AP-104 is 50ft.

¹Sulzer Bingham is a registered trademark of Sulzer Bingham Pumps, Inc.

- The following equivalent lengths were used:
 - ▶ a long radius 90 deg. elbow - 5.1 ft
 - ▶ a 45-deg elbow - 4.1 ft.
 - each pump pit - 200 ft
 - each valve pit - 200 ft

3.0 METHODOLOGY

The pressure drop estimate is based on the friction factor plot in figure 1. Reynolds numbers were then calculated for various flow rates, viscosities, and densities. The following formula was used for the calculation of the Reynolds Numbers:

$$Re_d = \frac{\rho v D}{\mu}$$

Where:

Re_d is the Reynolds Number for flow through pipe,

ρ is the fluid density,

v is the mean fluid velocity,

D is the pipe inside diameter,

μ is the fluid viscosity

The Reynolds Numbers were used to estimate friction factors from figure 1. The friction factors were then used to calculate the head loss through the pipe for an equivalent length of 2500 ft. The formula for the friction factor is as follows:

$$\mathcal{F} = \frac{h_L}{\left(\frac{L}{D}\right) \frac{v^2}{2g}}$$

Where:

\mathcal{F} is the friction factor,

h_L is the head Loss,

L is the equivalent length of the route,

D is the pipe diameter,

v is the mean fluid velocity,

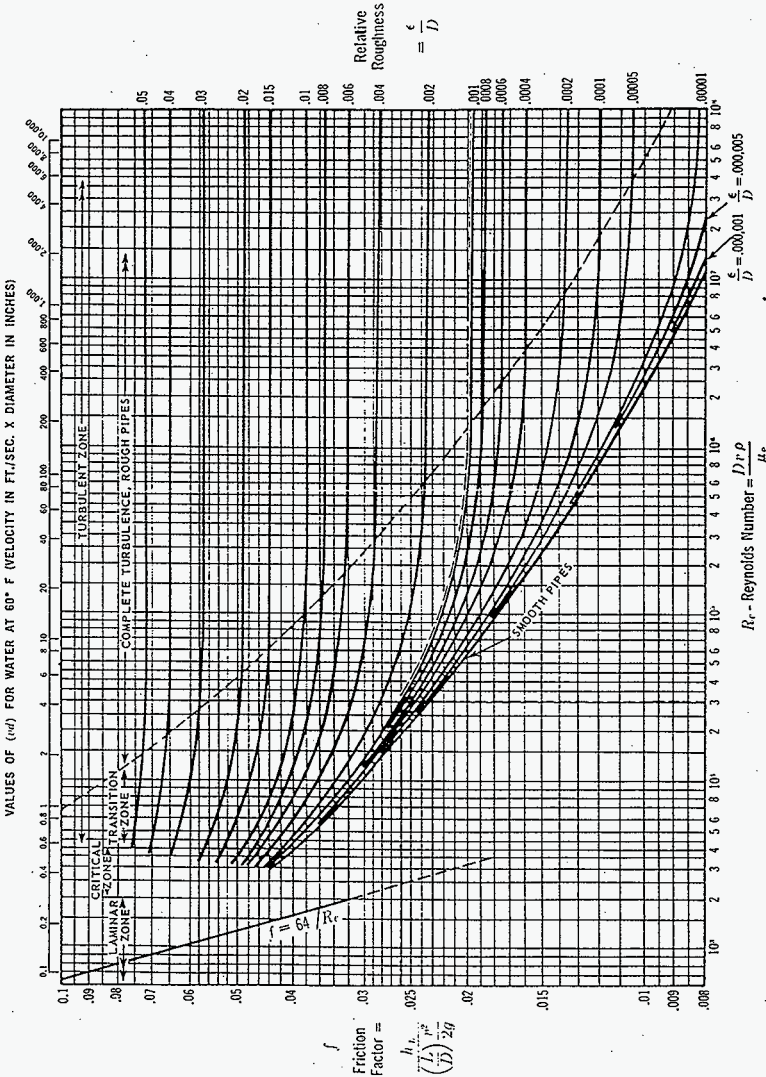
g is acceleration of gravity

This formula is rearranged and solved for the head loss. A hydraulic loss of 50 ft was added to the head loss to account for the difference in elevation between the two tanks.

Figure 1

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Friction Factors for Any Type of Commercial Pipe¹⁸



Problem: Determine the friction factor for 10-inch cast iron pipe (10.16" I.D.) at a Reynolds number of 30,000.

Solution: The relative roughness (see page A-23) is 0.001. Then, the friction factor (f) equals 0.026.

4.0 RESULTS

Tables 1 through 3 are reynolds numbers for each of the three densities. The reynolds numbers are based on 3" pipe and the flow rates given. Tables 4 through 6 are the friction factors corresponding to densities of 1.28, 1.34, and 1.42 g/ml respectively. Tables 7 through 9 are the head losses corresponding to the various flow rate and viscosity conditions. Figures 2 through 4 show the flow rate versus head losses at the different viscosities. Also plotted is the total head provided by the next generation transfer pump scheduled to be installed in some tanks (including AN-104) as part of Project W-211. The point where the two curves meet is where the pump should operate. It is easy to determine from the plotted curves, and the reynolds numbers below what the viscosity will need to be limited to achieve the 20,000 Reynolds Number minimum pumpability rule.

Table 1. Reynolds Numbers for a density of 1.28 g/ml

Reynolds Numbers for 3" Pipe for density of 1.28 g/ml					
Flow Rate gal/min	Viscosity (Cp)				
	5	10	15	20	30
90	23765	11882	7922	5941	3961
100	26405	13203	8802	6601	4401
110	29046	14523	9682	7261	4841
120	31686	15843	10562	7922	5281
130	34327	17163	11442	8582	5721
140	36967	18484	12322	9242	6161
150	39608	19804	13203	9902	6601
160	42248	21124	14083	10562	7041
170	44889	22445	14963	11222	7482
180	47530	23765	15843	11882	7922
190	50170	25085	16723	12543	8362
200	52811	26405	17604	13203	8802
210	55451	27726	18484	13863	9242
220	58092	29046	19364	14523	9682
230	60732	30366	20244	15183	10122

Table 2. Reynolds Numbers for a density of 1.34 g/ml

Reynolds Numbers for 3" Pipe for density of 1.34 g/ml					
Flow Rate gal/min	Viscosity (Cp)				
	5	10	15	20	30
90	24879	12439	8293	6220	4146
100	27643	13822	9214	6911	4607
110	30407	15204	10136	7602	5068
120	33172	16586	11057	8293	5529
130	35936	17968	11979	8984	5989
140	38700	19350	12900	9675	6450
150	41465	20732	13822	10366	6911
160	44229	22114	14743	11057	7371
170	46993	23497	15664	11748	7832
180	49757	24879	16586	12439	8293
190	52522	26261	17507	13130	8754
200	55286	27643	18429	13822	9214
210	58050	29025	19350	14513	9675
220	60815	30407	20272	15204	10136
230	63579	31790	21193	15895	10597

Table 3. Reynolds Numbers for a density of 1.42 g/ml

Reynolds Numbers for 3" Pipe for density of 1.42 g/ml					
Flow Rate gal/min	Viscosity (Cp)				
	5	10	15	20	30
90	26364	13182	8788	6591	4394
100	29293	14647	9764	7323	4882
110	32223	16111	10741	8056	5370
120	35152	17576	11717	8788	5859
130	38081	19041	12694	9520	6347
140	41011	20505	13670	10253	6835
150	43940	21970	14647	10985	7323
160	46869	23435	15623	11717	7812
170	49799	24899	16600	12450	8300
180	52728	26364	17576	13182	8788
190	55657	27829	18552	13914	9276
200	58587	29293	19529	14647	9764
210	61516	30758	20505	15379	10253
220	64445	32223	21482	16111	10741
230	67375	33687	22458	16844	11229

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Table 4. Friction Factors for a density of 1.28 g/ml

Friction Factors for 3" Pipe for density of 1.28 g/ml					
Flow Rate gal/min	Viscosity (Cp)				
	5	10	15	20	30
90	0.02600	0.03090	0.03400	0.03620	0.04000
100	0.02550	0.03000	0.03300	0.03520	0.03920
110	0.02520	0.02920	0.03230	0.03420	0.03800
120	0.02480	0.02830	0.03190	0.03400	0.03700
130	0.02450	0.02780	0.03150	0.03320	0.03620
140	0.02420	0.02720	0.03110	0.03250	0.03550
150	0.02390	0.02680	0.03000	0.03200	0.03480
160	0.02350	0.02650	0.02940	0.03190	0.03430
170	0.02320	0.02620	0.02890	0.03160	0.03400
180	0.02300	0.02600	0.02830	0.03090	0.03350
190	0.02280	0.02560	0.02810	0.03045	0.03320
200	0.02260	0.02550	0.02802	0.03000	0.03290
210	0.02245	0.02535	0.02720	0.02955	0.03250
220	0.02230	0.02520	0.02693	0.02920	0.03220
230	0.02210	0.02494	0.02670	0.02875	0.03190

Table 5. Friction Factors for a density of 1.34 g/ml

Friction Factors for 3" Pipe for density of 1.34 g/ml					
Flow Rate gal/min	Viscosity (Cp)				
	5	10	15	20	30
90	0.025789	0.03052	0.03358	0.03578	0.03950
100	0.025359	0.02963	0.03267	0.03473	0.03850
110	0.024994	0.02874	0.03209	0.0341	0.03780
120	0.024631	0.02802	0.03168	0.03355	0.03700
130	0.024317	0.02743	0.03126	0.03277	0.03620
140	0.024003	0.02694	0.03038	0.03217	0.03550
150	0.023619	0.02659	0.02958	0.03193	0.03490
160	0.023275	0.02628	0.02903	0.03168	0.03400
170	0.023041	0.02604	0.02842	0.03104	0.03350
180	0.022831	0.02566	0.02813	0.03052	0.03310
190	0.022622	0.02551	0.02803	0.03005	0.03290
200	0.022459	0.02536	0.02725	0.02958	0.03250
210	0.022302	0.0252	0.02693	0.02921	0.03230
220	0.022094	0.02493	0.02675	0.02895	0.03190
230	0.022	0.0243	0.02655	0.02835	0.03170

Table 6. Friction Factors for a density of 1.42 g/ml

Friction Factors for 3" Pipe for density of 1.42 g/ml					
Flow Rate gal/min	Viscosity (Cp)				
	5	10	15	20	30
90	0.02556	0.03004	0.03309	0.03522	0.03930
100	0.02514	0.02909	0.03233	0.03435	0.03800
110	0.02476	0.02826	0.03182	0.03374	0.03720
120	0.02441	0.0276	0.03138	0.03299	0.03670
130	0.02407	0.02705	0.03057	0.03231	0.03560
140	0.02368	0.02665	0.02971	0.03197	0.03480
150	0.02331	0.02631	0.02908	0.0317	0.03440
160	0.02305	0.02605	0.02845	0.03107	0.03370
170	0.02283	0.02566	0.02813	0.03051	0.03300
180	0.02261	0.0255	0.02802	0.03001	0.03270
190	0.02244	0.02534	0.02715	0.02951	0.03250
200	0.02227	0.02517	0.02687	0.02914	0.03210
210	0.02204	0.02486	0.0267	0.02888	0.03190
220	0.02197	0.02445	0.02649	0.02816	0.03150
230	0.0218	0.02425	0.02625	0.028	0.03120

Table 7. Total Head Loss for a density of 1.28 g/ml

Head Loss for 2500 ft equivalent Length and 50 ft Hydraulic Head for a density of 1.28 g/ml					
Flow Rate gal/min	Viscosity (Cp)				
	5	10	15	20	30
90	110.30	121.67	128.86	133.96	142.77
100	123.01	135.90	144.49	150.79	162.24
110	137.31	151.17	161.91	168.49	181.65
120	152.25	166.69	181.53	190.19	202.56
130	168.55	184.52	202.43	210.65	225.17
140	185.81	202.65	224.54	232.39	249.23
150	203.97	222.66	243.27	256.16	274.20
160	222.26	244.25	265.50	283.83	301.42
170	241.98	266.80	289.15	311.49	331.35
180	263.37	291.20	312.54	336.66	360.78
190	285.67	314.61	340.46	364.75	393.17
200	308.84	342.06	370.92	393.60	426.81
210	333.48	370.10	393.46	423.13	460.38
220	359.04	399.23	423.21	454.66	496.24
230	384.75	427.76	454.42	485.47	533.18

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Table 8. Total Head Loss for a density of 1.34 g/ml
Head Loss for 2500 ft equivalent Length and 50 ft Hydraulic Head
for a density of 1.34 g/ml

Flow Rate gal/min	Viscosity (Cp)				
	5	10	15	20	30
90	109.81	120.78	127.88	132.98	141.61
100	122.61	134.83	143.55	149.45	160.24
110	136.59	149.56	161.19	168.13	180.96
120	151.56	165.53	180.60	188.33	202.56
130	167.67	182.75	201.25	208.59	225.17
140	184.71	201.18	220.48	230.55	249.23
150	202.16	221.30	240.55	255.70	274.84
160	220.61	242.60	262.75	282.18	299.22
170	240.66	265.48	285.19	306.87	327.21
180	261.81	288.07	310.98	333.14	357.07
190	283.83	313.69	339.72	360.60	390.07
200	307.23	340.45	362.11	388.76	422.23
210	331.62	368.23	390.10	418.84	457.86
220	356.18	395.52	420.71	451.20	492.08
230	383.23	418.07	452.15	479.41	530.16

Table 9. Total Head Loss for a density of 1.42 g/ml
Head Loss for 2500 ft equivalent Length and 50 ft Hydraulic Head
for a density of 1.42 g/ml

Flow Rate gal/min	Viscosity (Cp)				
	5	10	15	20	30
90	109.28	119.67	126.75	131.67	141.15
100	121.99	133.31	142.56	148.36	158.81
110	135.77	147.93	160.24	166.89	178.88
120	150.63	163.80	179.36	186.04	201.32
130	166.49	180.89	197.95	206.33	222.27
140	182.90	199.54	216.73	229.41	245.30
150	200.18	219.49	237.36	254.24	271.62
160	218.97	240.96	258.53	277.75	297.02
170	238.90	262.31	282.75	302.49	323.07
180	259.72	286.56	309.95	328.44	353.36
190	281.93	311.92	330.60	355.08	385.94
200	305.08	338.30	357.78	383.73	417.65
210	328.31	363.95	387.19	414.72	452.81
220	354.48	388.84	417.07	440.28	486.54
230	380.20	417.31	447.61	474.11	522.58

The curves in figures 2 through 4 and the tables above were prepared using the spreadsheet program Quattro Pro² for DOS³. Once the spreadsheet was developed, equivalent lengths from 1000 to 5000 feet were substituted and the graphs were re-plotted with the new performance information. These plots are included as figures 5 through 13. All of these figures are at a density of 1.28 g/ml. Over the range of densities from 1.28 to 1.42, no appreciable differences in the performance curves were seen.

The Sulzer Bingham pumps have a variable speed motor. Figure 14 shows a 2500 ft equivalent length transfer with 50 ft of hydraulic head at viscosities of 5 and 30 Cp with the pump operating at 3600, 3150, 2700, and 2250 revolutions per minute.

²QUATTRO PRO is a registered trademark of Borland International, Inc.

³DOS is a trademark of Microsoft Corporation.

Transfer from 104-AN to 104-AP
Head Loss and Pump Curve at SpG=1.28

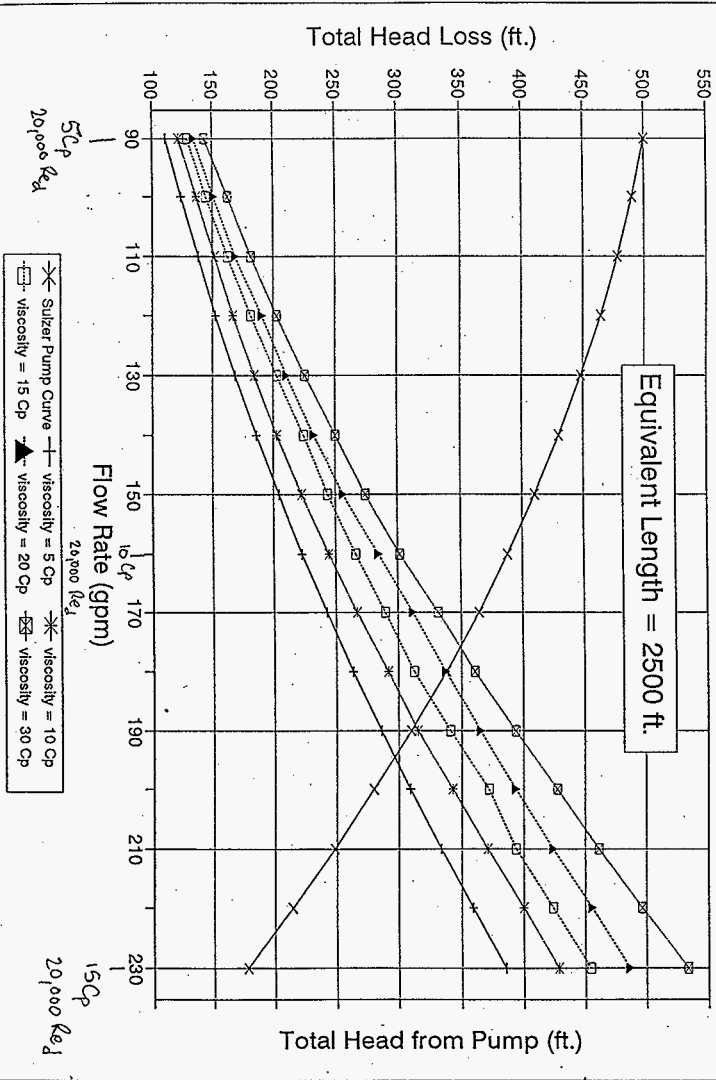
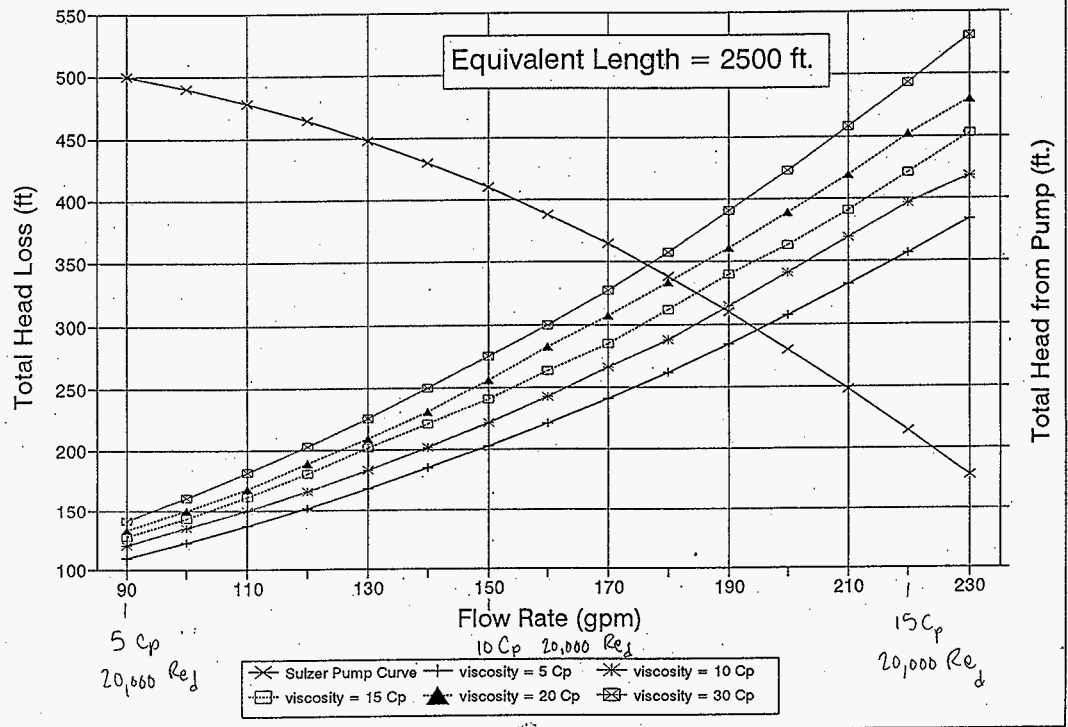


Figure 2

Transfer from 104-AN to 104-AP
Head Loss and Pump Curve at SpG=1.34

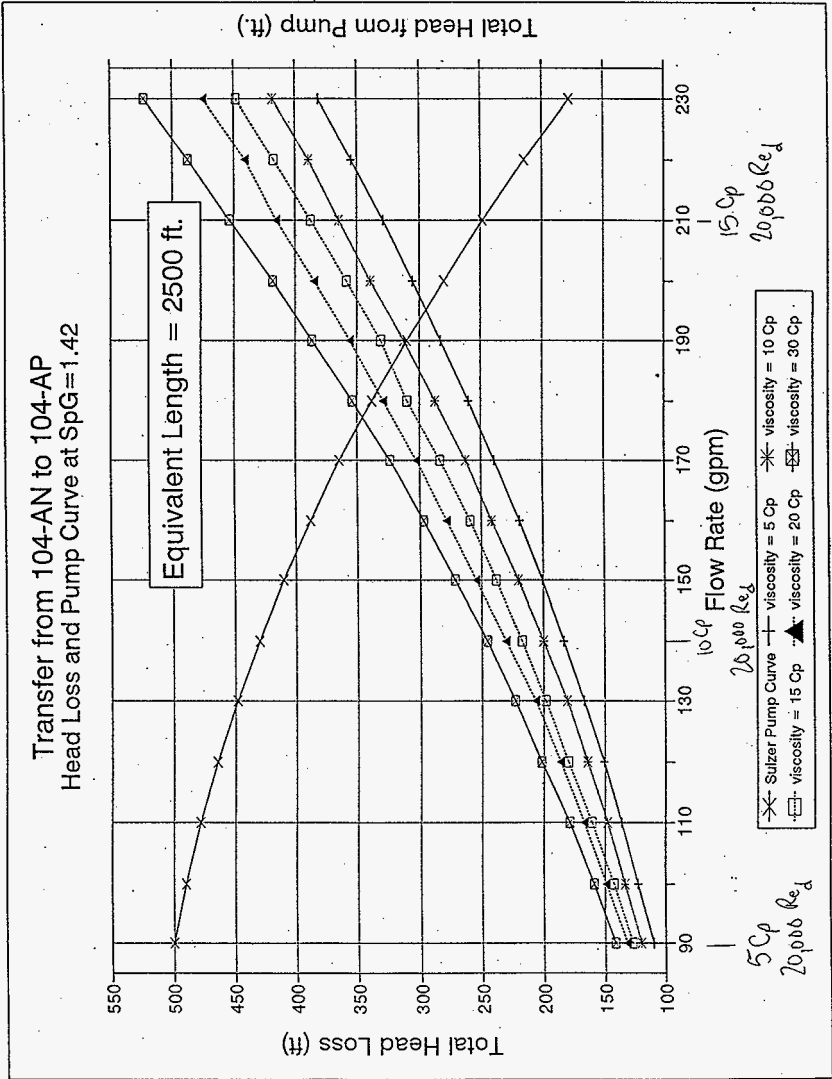


D-13

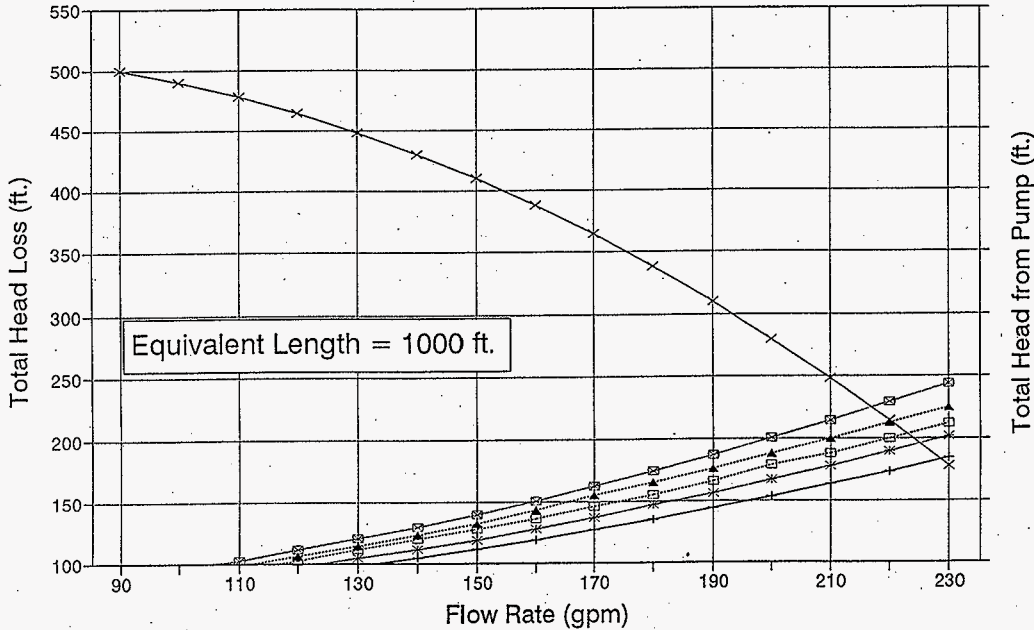
Figure 3

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FIGURE 4



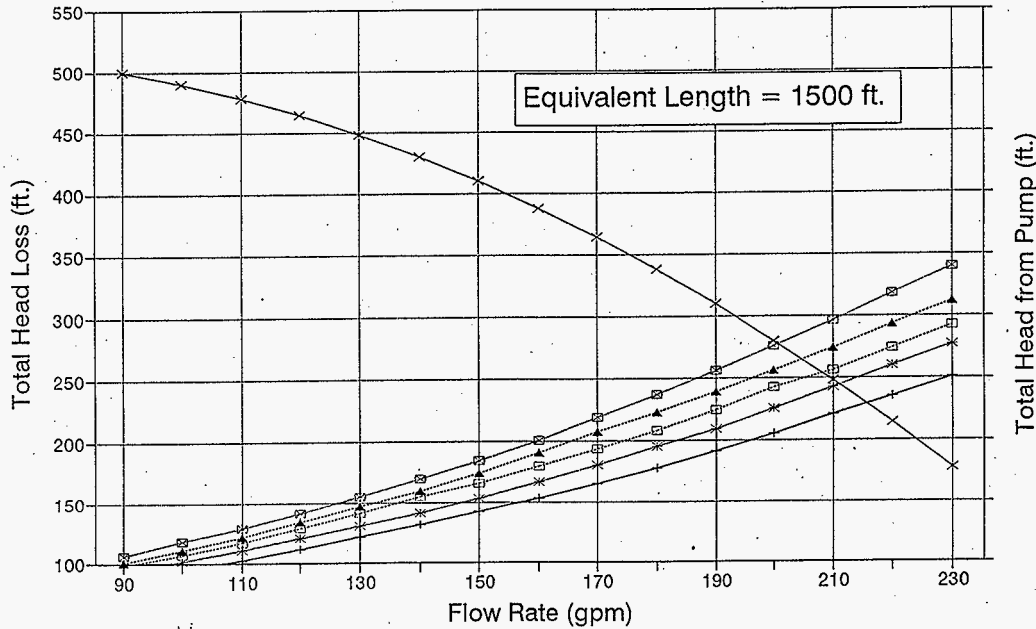
Transfer Along the proposed new route Head Loss and Pump Curve at SpG=1.28



✕ Sulzer Pump Curve + viscosity = 5 Cp * viscosity = 10 Cp
 □ viscosity = 15 Cp ▲ viscosity = 20 Cp ⊠ viscosity = 30 Cp

Figure 5

Transfer Along the proposed new route
Head Loss and Pump Curve at SpG=1.28



✕ Sulzer Pump Curve + viscosity = 5 Cp ✖ viscosity = 10 Cp
 □ viscosity = 15 Cp ▲ viscosity = 20 Cp ⊠ viscosity = 30 Cp

Total Head from Pump (ft.)

FIGURE 6

FIGURE 7

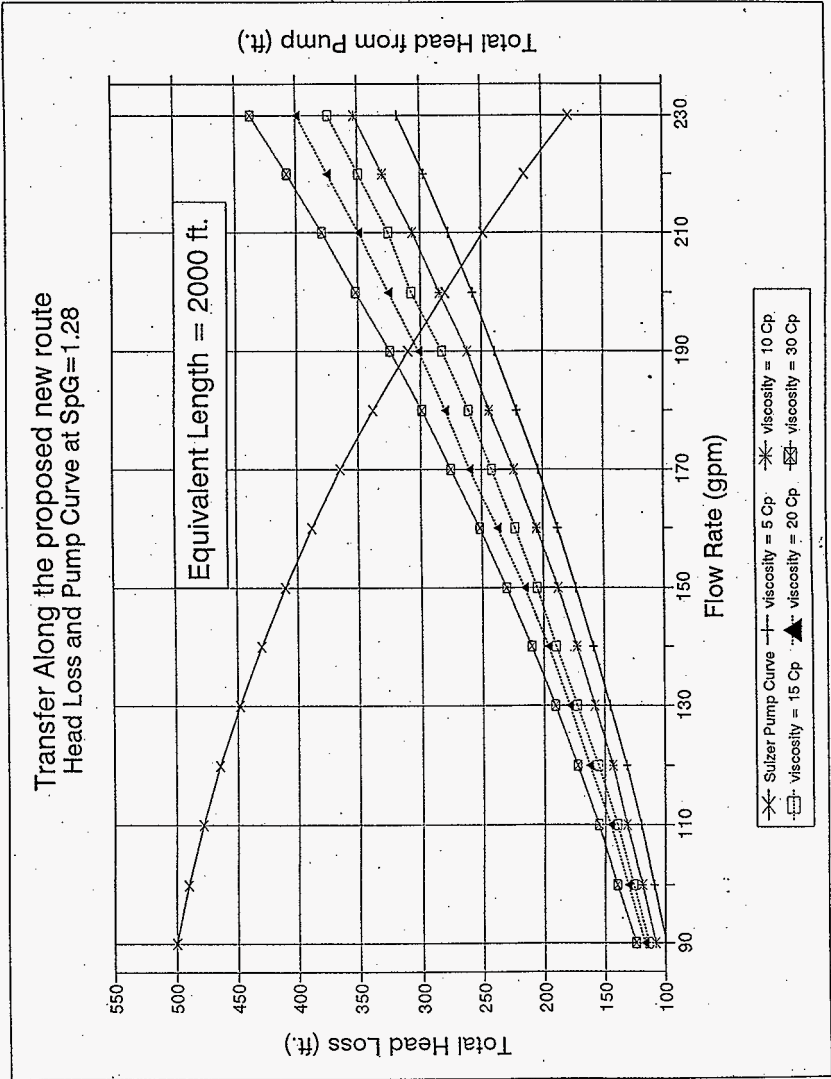


FIGURE 8

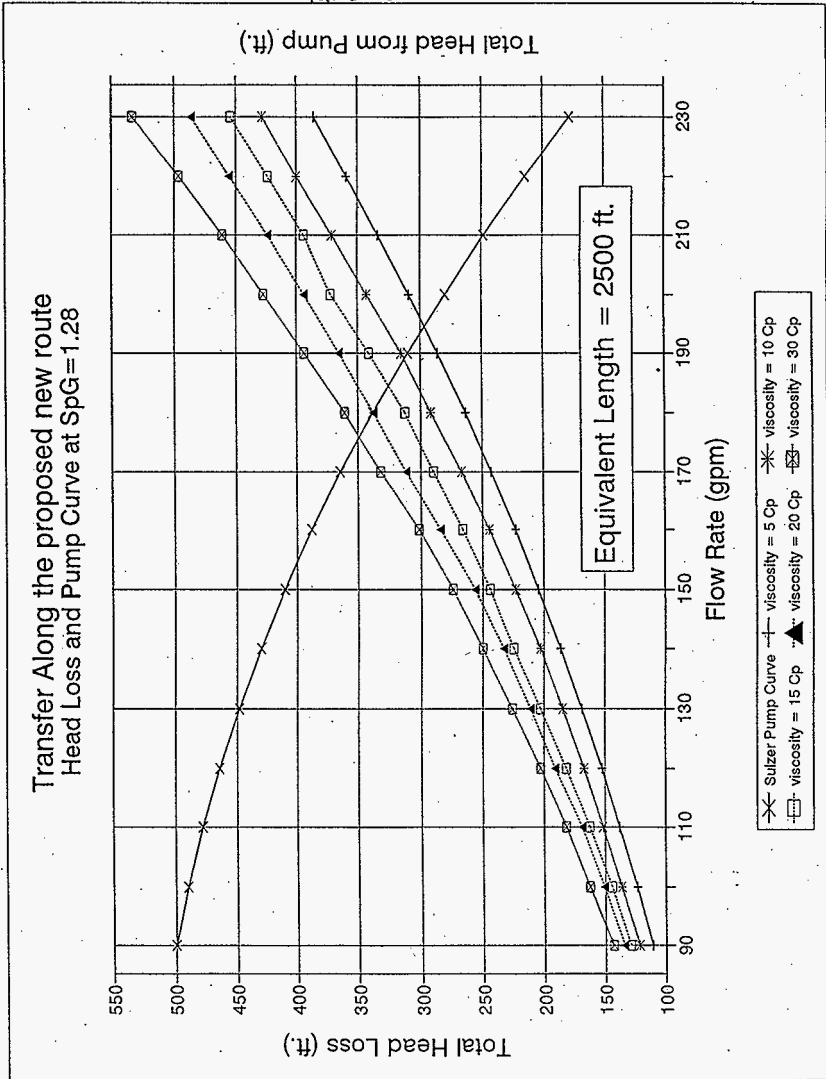
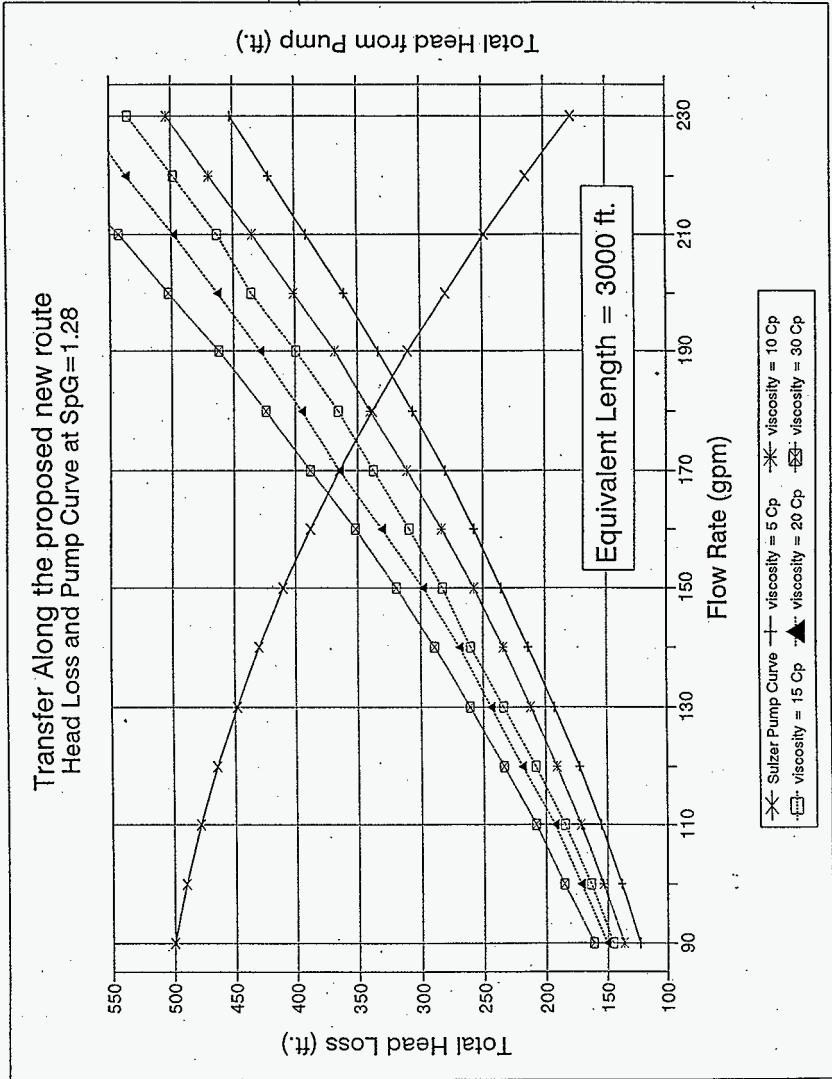
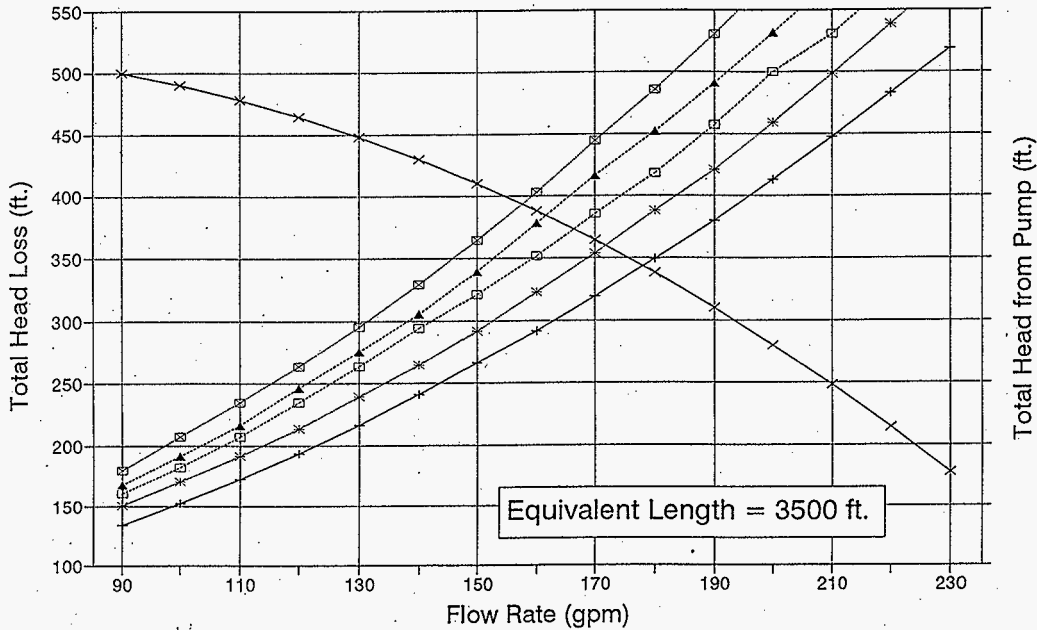


FIGURE 9



Transfer Along the proposed new route Head Loss and Pump Curve at SpG=1.28



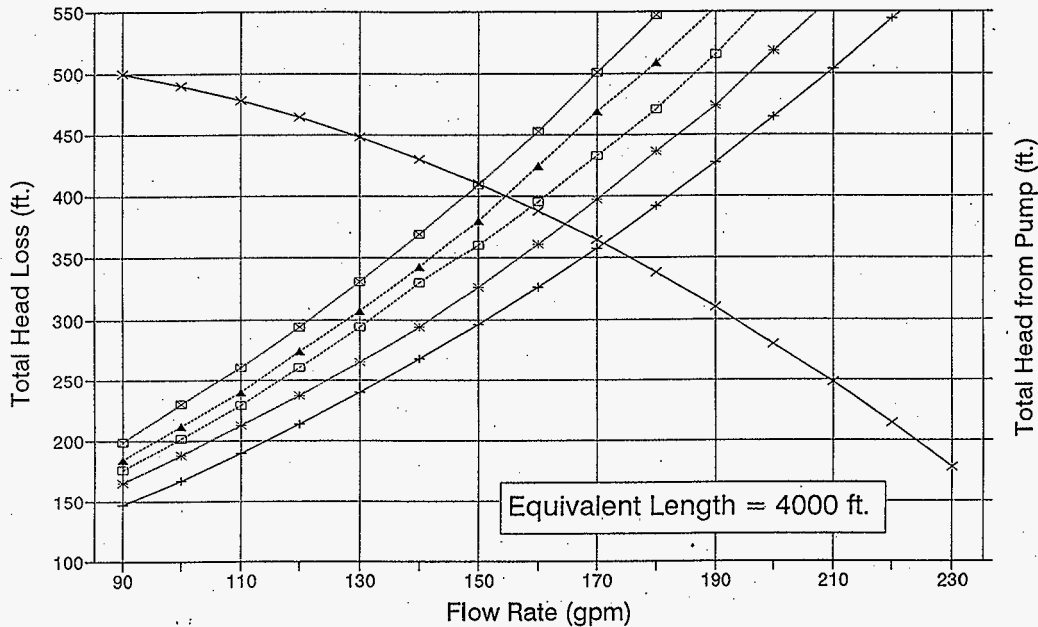
Total Head from Pump (ft.)

Equivalent Length = 3500 ft.

- x— Sulzer Pump Curve
- +— viscosity = 5 Cp
- *— viscosity = 10 Cp
- viscosity = 15 Cp
- ▲— viscosity = 20 Cp
- ⊠— viscosity = 30 Cp

FIGURE 10

Transfer Along the proposed new route Head Loss and Pump Curve at SpG=1.28

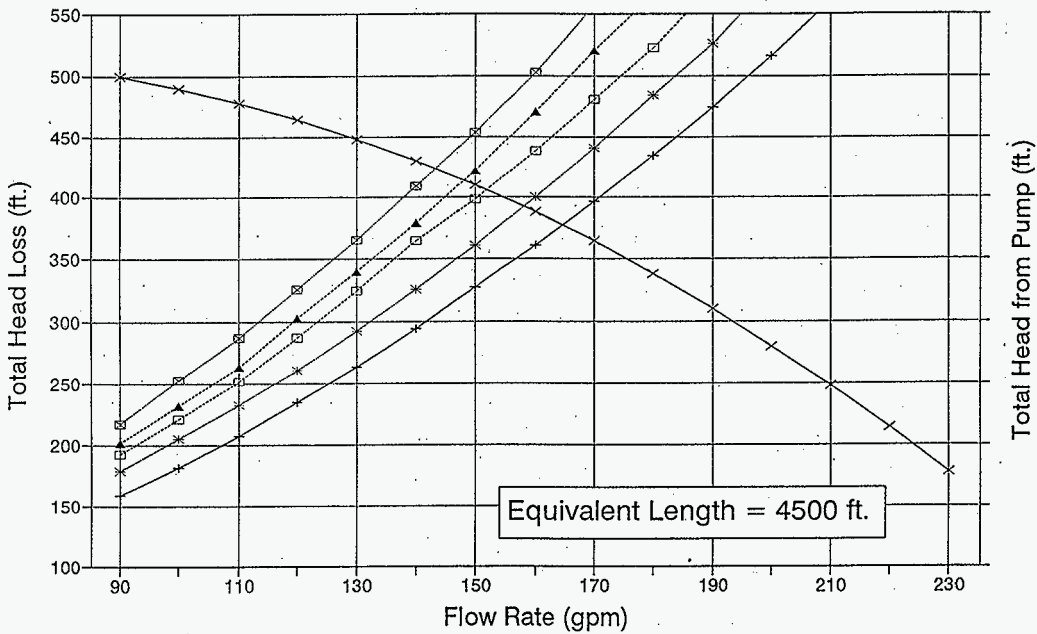


—x— Sulzer Pump Curve —+— viscosity = 5 Cp —*— viscosity = 10 Cp
—□— viscosity = 15 Cp —▲— viscosity = 20 Cp —□— viscosity = 30 Cp

Total Head from Pump (ft.)

Figure 11

Transfer Along the proposed new route Head Loss and Pump Curve at SpG=1.28



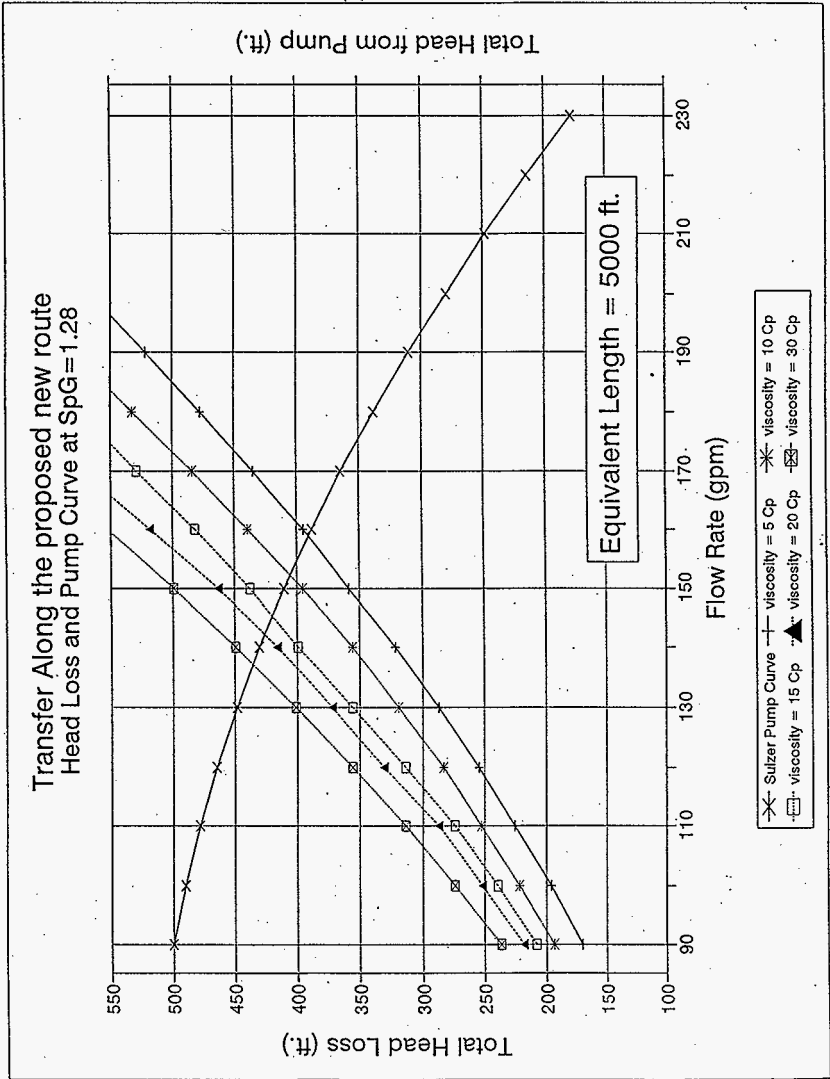
- | | | |
|---------------------|---------------------|---------------------|
| ✕ Sulzer Pump Curve | + viscosity = 5 Cp | ✱ viscosity = 10 Cp |
| □ viscosity = 15 Cp | ▲ viscosity = 20 Cp | ⊠ viscosity = 30 Cp |

D-22

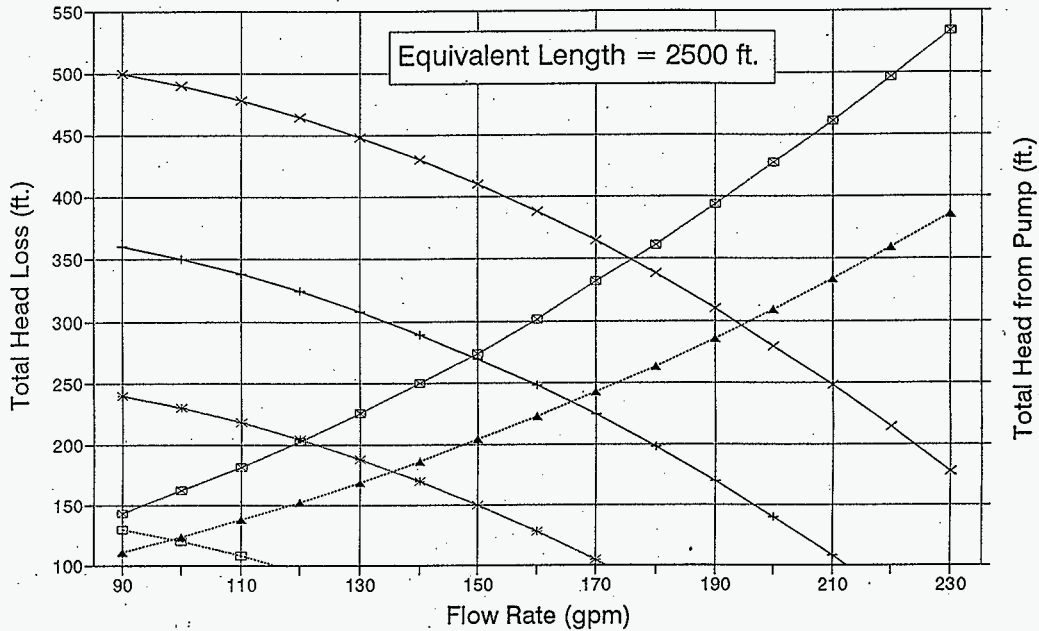
Figure 12

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FIGURE B



Transfer from 104-AN to 104-AP
Head Loss and Pump Curve at SpG=1.28



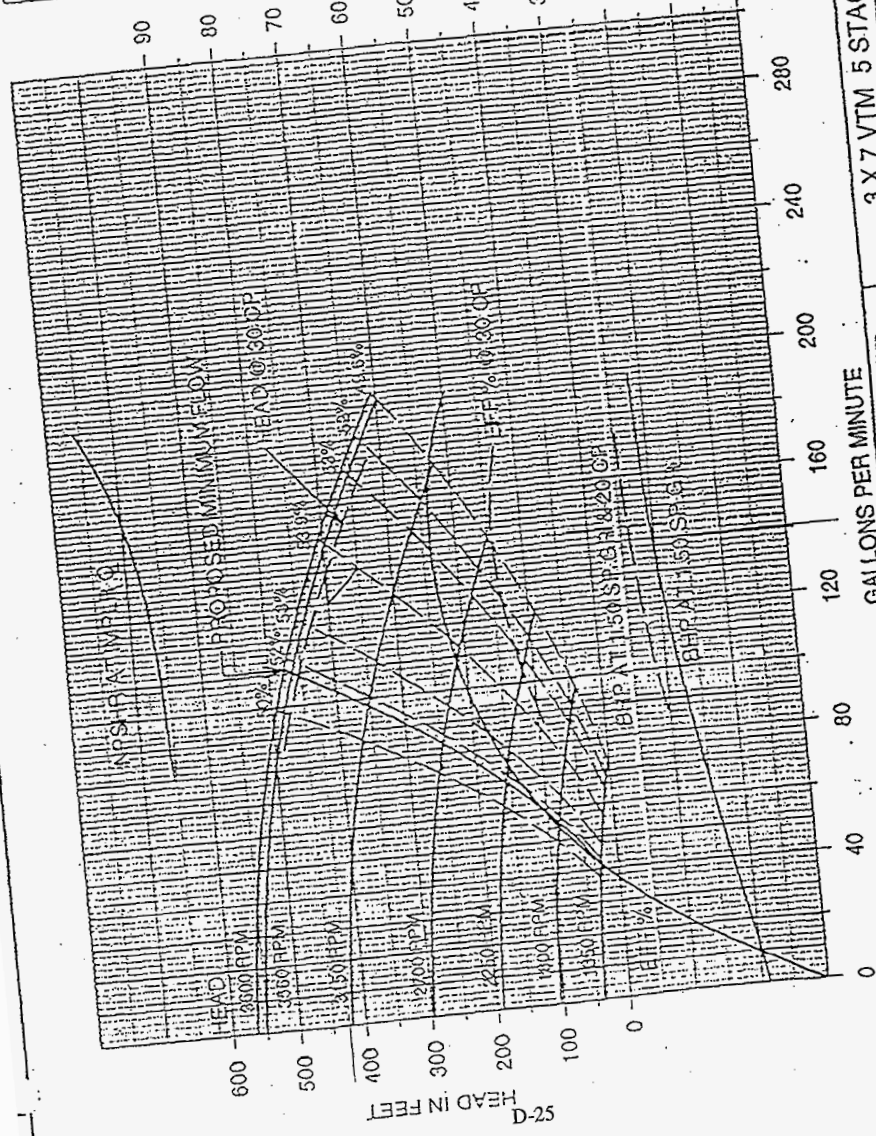
57626

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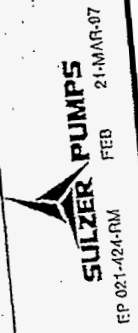
NPSH IN FEET
30
20
10

EFFICIENCY PERCENT
90
80
70
60
50
40

BHP
60
40
20
0



IMPELLER DIA MAX DIA 5.94"	IMPELLER PATT 7VTM	VAR RPM CURVE NO. 57626
DIA IMPELLER 5.75"		REFERENCE
EYE AREA SQ IN 2.5		



WESTINGHOUSE-
HANFORD COMPANY
SLURRY TRANSFER PUMP

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APPENDIX E
TRANSFER REQUIREMENTS REVIEW

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AP to AW Tank Farm

Boot Strap	HLW Flag	LAW Flag	From	To	Start Date	End Date	Liquid (gallons)	Solid (gallons)	Notes
			AP-104	AW-102	3/1/98	3/6/98	995,300	34	
			AP-107	AW-102	4/25/98	5/7/98	1,104,000	40	
			AP-101	AW-103	8/6/98	8/9/98	625,000	27	
			EVAPF	AW-102	10/13/98	10/14/98	195,000	0	
			AP-101	AW-104	10/21/98	10/23/98	460,000	20	
			AP-104	AW-102	10/3/98	11/10/98	1,110,000	42	
			AP-107	AW-102	2/15/99	3/9/99	1,095,000	40	
			AP-103	AW-102	7/1/99	7/8/99	1,017,000	44	
			EVAPF	AW-102	9/7/99	9/7/99	70,000	0	
Y		Y	AP-104	AW-102	9/10/99	9/29/99	1,104,000	41	Empty 4AP
			AP-107	AW-102	11/1/99	11/8/99	1,110,000	43	
			AP-104	AW-102	7/2/00	7/8/00	1,110,000	43	
Y		Y	AP-106	AW-102	10/2/00	10/4/00	474,000	16	Empty 6AP
Y		Y	AP-106	AW-102	10/5/00	10/5/00	71,998	2	Empty 6AP
Y		Y	AP-106	AW-102	10/6/00	10/6/00	130,000	4	Empty 6AP
Y		Y	AP-106	AW-102	10/7/00	10/7/00	60,191	2	Empty 6AP
Y		Y	AP-106	AW-102	10/8/00	10/8/00	0	0	Empty 6AP
			AP-106	AW-102	2/7/01	2/7/01	0	0	
			EVAPF	AW-102	10/19/01	10/20/01	225,000	0	
			EVAPF	AW-102	9/20/02	9/20/02	50,000	0	
			EVAPF	AW-102	9/20/03	9/20/03	35,000	0	
			EVAPF	AW-102	9/20/04	9/20/04	85,000	0	
			EVAPF	AW-102	9/20/05	9/20/05	35,000	0	
			EVAPF	AW-102	9/20/07	9/20/07	35,000	0	
			EVAPF	AW-102	9/20/08	9/20/08	85,000	0	
			EVAPF	AW-102	9/20/09	9/20/09	35,000	0	
			EVAPF	AW-102	9/20/10	9/20/10	85,000	0	
			EVAPF	AW-102	10/19/10	10/19/10	35,000	0	

AW to AP Tank Farm

Boot Strap	HLW Flag	LAW Flag	From	To	Start Date	End Date	Liquid (gallons)	Solid (gallons)	Notes
			AW-106	AP-105	6/3/98	6/4/98	341,000	16	
			AW-104	AP-107	10/10/98	10/12/98	540,000	18	
			AW-104	AP-104	10/14/98	10/14/98	184,000	6	
			AW-106	AP-101	10/27/98	10/28/98	289,000	13	
			AW-106	AP-101	12/1/98	12/3/98	563,900	25	
			AW-106	AP-101	4/3/99	4/4/99	224,000	10	
			AW-106	AP-108	7/25/99	7/25/99	143,000	6	
			AW-106	AP-107	9/14/00	9/18/00	778,200	34	
			AW-106	AP-107	11/3/00	11/3/00	86,999	5	
		Y	AW-101	AP-102	1/9/03	1/13/03	537,200	13,013	Retrieve/Stage LAW Batch 3, Contractor 1, Envelope A
		Y	AW-101	AP-102	1/9/03	1/13/03	845,400	13,013	As-received Ghost
		Y	AW-101	AP-104	1/14/03	1/18/03	537,200	13,013	Retrieve/Stage LAW Batch 3, Contractor 2, Envelope A
		Y	AW-101	AP-104	1/14/03	1/18/03	845,400	13,013	As-received Ghost

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AY-101 to AP-102/104

Boot Strap	HLW Flag	LAW Flag	From	To	Start Date	End Date	Liquid (gallons)	Solid (gallons)	Notes
		Y	AY-101	AP-102	5/15/04	5/16/04	283,600	12	Stage LAW Batch 5, Envelope B, Contractor 1
		Y	AY-101	AP-104	5/17/04	5/18/04	279,700	11	Stage LAW Batch 5, Envelope B, Contractor 2

AY-102 to AN Tank Farm and PC

Boot Strap	HLW Flag	LAW Flag	From	To	Start Date	End Date	Liquid (gallons)	Solid (gallons)	notes
Y	Y		AY-102	AN-105	3/26/05	3/30/05	724,600	0	Initial Decant 2AY/6C
	Y		AY-102	AN-105	5/20/05	5/26/05	302,200	0	First Wash Decant 2AY/6C
	Y		AY-102	AN-105	7/17/05	7/19/05	322,100	0	Second Wash Decant 2AY/6C
	Y		AY-102	P1HLW_FE	6/12/06	6/12/06	135,000	3,416	Deliver Batch 1 of 2AY/6C, Envelope D (Batch 6 Overall)
	Y		AY-102	P1HLW_FE	1/4/07	1/4/07	135,000	3,416	Deliver Batch 2 of 2AY/6C, Envelope D (Batch 7 Overall)
	Y		AY-102	P1HLW_FE	7/29/07	7/29/07	135,000	3,416	Deliver Batch 3 of 2AY/6C, Envelope D (Batch 8 Overall)
	Y		AY-102	P1HLW_FE	2/20/08	2/20/08	135,000	3,416	Deliver Batch 4 of 2AY/6C, Envelope D (Batch 9 Overall)
	Y		AY-102	P1HLW_FE	9/13/08	9/13/08	135,000	3,416	Deliver Batch 5 of 2AY/6C, Envelope D (Batch 10 Overall)
	Y		AY-102	P1HLW_FE	4/7/09	4/7/09	135,000	3,416	Deliver Batch 6 of 2AY/6C, Envelope D (Batch 11 Overall)

AZ Tank Farm to AY-101

Boot Strap	HLW Flag	LAW Flag	From	To	Start Date	End Date	Liquid (gallons)	Solid (gallons)	Notes
Y	Y	Y	AZ-101	AY-101	8/18/00	8/21/00	685,000	0	Pre-stage Envelope B/Initial Decant Envelope D
Y	Y	Y	AZ-102	AY-101	1/11/02	1/12/02	204,000	0	Pre-stage Envelope B (Blending Stock)/Initial Decant Envelope D

AZ-102 to AN Tank Farm

Boot Strap	HLW Flag	LAW flag	From	To	Start Date	End Date	Liquid (gallons)	Solid (gallons)	Notes
Y	Y	Y	AZ-102	AY-101	1/11/02	1/12/02	204,000	0	Pre-stage Envelope B (Blending Stock)/Initial Decant Envelope D
Y	Y		AZ-102	AN-104	1/12/02	1/13/02	181,800	0	Complete Initial Decant Envelope D
	Y		AZ-102	AN-105	3/4/02	3/5/02	72,225	0	First Decant 2AZ
	Y		AZ-102	AN-105	4/25/02	4/26/02	208,800	0	Second Wash Decant 2AZ
	Y		AZ-102	AN-105	6/16/02	6/17/02	210,700	0	Third Wash Decant 2AZ
	Y		AZ-102	AN-105	8/7/02	8/8/02	211,700	0	Fourth Wash Decant 2AZ
	Y		AZ-102	P1HLW_FE	11/20/03	11/21/03	145,900	6,032	Deliver Batch 1 of 2AZ, Envelope D (Batch 3 Overall)
	Y		AZ-102	P1HLW_FE	9/26/04	9/27/04	145,900	6,032	Deliver Batch 2 of 2AZ, Envelope D (Batch 4 Overall)
	Y		AZ-102	P1HLW_FE	8/4/05	8/5/05	145,900	6,032	Deliver Batch 3 of 2AZ, Envelope D (Batch 5 Overall)

AZ-101 to AN-105

Boot Strap	HLW Flag	LAW Flag	From	To	Start Date	End Date	Liquid (gallons)	Solid (gallons)	notes
Y	Y	Y	AZ-101	AY-101	8/18/00	8/21/00	685,000	0	Pre-stage Envelope B/Initial Decant Envelope D
	Y		AZ-101	AW-105	10/10/00	10/10/00	142,500	0	First Wash Decant 1AZ
	Y		AZ-101	AW-105	11/30/00	12/1/00	140,200	0	Second Wash Decant 1AZ
	Y		AZ-101	AW-105	1/21/01	1/21/01	142,900	0	Third Wash Decant 1AZ
	Y		AZ-101	P1HLW_FE	5/17/02	5/17/02	136,000	5,135	Deliver Batch 1 of 1AZ, Envelope D (Batch 1 Overall)
	Y		AZ-101	P1HLW_FE	2/24/03	2/25/03	136,000	5,135	Deliver Batch 2 of 1AZ, Envelope D (Batch 2 Overall)

Transfers AN to AP

Boot Strap	HLW Flag	LAW Flag	From	To	Start Dat	End Date	Liquid (gallons)	Solid (gallons)	Notes
			AN-101	AP-103	3/2/99	3/7/99	1,024,000	0	
		Y	AN-105	AP-102	3/17/01	3/20/01	542,400	7,895	Retrieve/Stage LAW Batch 1, Contractor 1, Envelope A
		Y	AN-105	AP-102	3/17/01	3/20/01	686,500	294	As-received Ghost
		Y	AN-105	AP-104	3/21/01	3/24/01	542,400	7,895	Retrieve/Stage LAW Batch 1, Contractor 2, Envelope A
		Y	AN-105	AP-104	3/21/01	3/24/01	686,500	294	As-received Ghost
		Y	AN-104	AP-102	10/1/01	10/4/01	502,200	12,513	Retrieve/Stage LAW Batch 2, Contractor 1, Envelope A
		Y	AN-104	AP-102	10/1/01	10/4/01	684,700	702	As-received Ghost
		Y	AN-104	AP-104	10/5/01	10/8/01	502,200	12,513	Retrieve/Stage LAW Batch 2, Contractor 2, Envelope A
		Y	AN-104	AP-104	10/5/01	10/8/01	684,700	702	As-received Ghost
		Y	AN-103	AP-102	10/3/03	10/6/03	436,600	28,133	Retrieve/Stage LAW Batch 4, Contractor 1, Envelope A
		Y	AN-103	AP-102	10/3/03	10/6/03	738,300	549	As-received Ghost
		Y	AN-103	AP-104	10/7/03	10/10/03	436,600	28,133	Retrieve/Stage LAW Batch 4, Contractor 2, Envelope A
		Y	AN-103	AP-104	10/7/03	10/10/03	738,300	549	As-received Ghost
			AN-103	AP-105	1/18/05	1/18/05	43,576	1,147	
			AN-103	AP-103	1/18/05	1/18/05	42,878	1,128	
			AN-103	AP-101	1/18/05	1/18/05	38,554	1,014	
		Y	AN-107	AP-102	3/21/05	3/23/05	481,700	22	Retrieve/Stage LAW Batch 6/7, Contractor 1, Envelope C
		Y	AN-107	AP-102	3/21/05	3/23/05	554,000	22	As-received Ghost
		Y	AN-107	AP-104	3/24/05	3/26/05	481,700	22	Retrieve/Stage LAW Batch 6/7, Contractor 2, Envelope C
		Y	AN-107	AP-104	3/24/05	3/26/05	554,000	22	As-received Ghost
		Y	AN-102	AP-102	8/13/05	8/16/05	481,700	23	Retrieve/Stage LAW Batch 8, Contractor 1, Envelope C
		Y	AN-102	AP-102	8/13/05	8/16/05	770,700	23	As-received Ghost
		Y	AN-102	AP-104	8/17/05	8/20/05	481,700	23	Retrieve/Stage LAW Batch 8, Contractor 2, Envelope C
		Y	AN-102	AP-104	8/17/05	8/20/05	770,700	23	As-received Ghost
		Y	AN-106	AP-102	12/28/05	12/31/05	547,500	24	Retrieve/Stage LAW Batch 9, Contractor 1, Envelope C
		Y	AN-106	AP-102	12/28/05	12/31/05	648,100	24	As-received Ghost
		Y	AN-106	AP-104	1/1/06	1/4/06	547,500	24	Retrieve/Stage LAW Batch 9, Contractor 2, Envelope C
		Y	AN-106	AP-104	1/1/06	1/4/06	648,100	24	As-received Ghost
		Y	AN-102	AP-102	8/25/06	8/30/06	1,014,000	44	Stage LAW Batch 10, Contractor 1, Envelope C
		Y	AN-107	AP-104	9/1/06	9/5/06	978,400	43	Stage LAW Batch 10, Contractor 2, Envelope C
		Y	AN-102	AP-102	3/19/07	3/22/07	711,200	31	Stage LAW Batch 11, Contractor 1, Envelope C
		Y	AN-107	AP-104	3/24/07	3/26/07	524,700	23	Stage LAW Batch 11, Contractor 2, Envelope C
			AN-103	AP-107	10/20/08	10/25/08	1,113,000	3,571	
			AN-102	AP-108	6/3/11	6/5/11	567,600	4,472	
			AN-103	AP-104	6/3/11	6/8/11	1,100,000	16,309	
			AN-103	AP-108	6/8/11	6/8/11	1,286	19	
			AN-102	AP-108	6/12/11	6/14/11	373,800	11,944	
			AN-102	AP-102	6/14/11	6/17/11	624,400	19,936	
			AN-102	AP-106	6/17/11	6/17/11	85,246	2,710	
			AN-102	AP-106	6/24/11	6/27/11	712,100	1,647	

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Evaporator and AP to AN

Boot Strap	HLW Flag	LAW Flag	From	To	Start Date	End Date	Liquid (gallons)	Solid (gallons)	Notes
Y		Y	AP-108	AN-105	3/25/01	3/26/01	319,500	7	Empty 8 AP
Y		Y	AP-108	AN-105	3/28/01	3/28/01	213,600	925	Empty 8AP
		Y	AP-107	AN-104	1/1/02	1/4/02	865,700	39	Empty 7AP for Vendor Returns (Sr/TRU/Entrained Solids)
			EVAPF	AN-105	9/17/02	9/17/02	120,000	0	
			EVAPF	AN-105	9/17/03	9/17/03	120,000	0	
		Y	AP-102	AN-105	5/13/04	5/13/04	209,500	9,168	Cleanout Accumulated Solids
		Y	AP-104	AN-105	5/14/04	5/14/04	209,500	9,168	Cleanout Accumulated Solids
			EVAPF	AN-105	9/17/04	9/17/04	120,000	0	
			EVAPF	AN-105	9/17/05	9/17/05	120,000	0	
			EVAPF	AN-105	9/17/06	9/17/06	120,000	0	
			EVAPF	AN-105	9/17/07	9/17/07	120,000	0	
			EVAPF	AN-105	9/17/08	9/17/08	120,000	0	
			EVAPF	AN-105	9/17/09	9/17/09	120,000	0	
			EVAPF	AN-105	9/17/10	9/18/10	120,000	0	

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APPENDIX F
EQUIPMENT AVAILABILITY MATRIX

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ALTERNATIVE 3 TRANSFER MATRIX

EQUIPMENT AVAILABILITY MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-102	AN-103 pump pit 103A SH pump P-007 to nozzle A	Jumper or manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
(10/03/03)	Nozzle A to 3" line SH-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-080201 SH 5
	Valve pit AN-B nozzle R14 to nozzle R11	Jumper or manifold from nozzle R14 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle E	Jumper or manifold from nozzle D to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP040 to 241-AP-040 pump pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	241-AP-040 pump pit nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E		No	W-211	No	H-14-102097 SH 1
	241-AP-040 pump pit nozzle E line 3" SH-624 to 241-AP-020 pump pit nozzle C	3" transfer line		No	W-211		H-14-102097 SH 1
	241-AP-020 pump pit nozzle C 3" line SH-622 to 241-AP-02A nozzle K	3" transfer line	Yes		N/A		H-14-020803 SH 3
	241-AP-02A pump pit nozzle K to floor nozzle E	Jumper or manifold from nozzle K to floor nozzle E		No	W-211		H-14-102096 SH 1

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-104 (10/07/03)	AN-103 pump pit 03A SN pump P-007 to nozzle A	Jumper or manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Nozzle A to 3" line SN-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-080201 SH 5
	Valve pit AN-B nozzle R14 to nozzle R11	Jumper or manifold from nozzle R14 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle E	Jumper or manifold from nozzle D to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	AP-104-04D pump pit nozzle C to nozzle A	Jumper or manifold from nozzle C to nozzle A		No	W-211		H-14-102097 SH 1
	AP-104-04D pump pit nozzle A 3" line SN-623 to AP-104-04A central pump pit nozzle K	3" transfer line		No	W-211		H-14-102096 SH 1
AP-104-04A central pump pit nozzle K to floor nozzle E	Jumper or manifold from nozzle K to floor nozzle E		No	W-211		H-14-102096 SH 1	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-103 to AP-105 01/18/05)	AN-103 pump pit 103A SN pump P-007 to nozzle A	Jumper or manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Nozzle A to 3" line SN-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-080201 SH 5
	Valve pit AN-B nozzle R14 to nozzle R11	Jumper or manifold from nozzle R14 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle F	Jumper or manifold from nozzle C to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to 3" line AN03VP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 24	Jumper or manifold from nozzle 15 to nozzle 24		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 24 to 3" line SN-015 to tank AP-105 pump pit 05A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 2
Pump pit 05A nozzle A to tank return nozzle E	Jumper or manifold from nozzle A to nozzle E.	Yes		N/A		H-14-020803 SH 2	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-103 (01/18/05)	AN-103 pump pit 103A SN pump P-007 to nozzle A	Jumper or manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Nozzle A to 3" line SH-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-080201 SH 5
	Valve pit AN-B nozzle R14 to nozzle R11	Jumper or manifold from nozzle R14 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle F	Jumper or manifold from nozzle D to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to 3" line AN03VP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 17	Jumper or manifold from nozzle 15 to nozzle 17		No			W-314 alternative analysis
	241-AP-valve pit nozzle 17 to 3" line SH-613 to tank AP-103 pump pit 03A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 1
Pump pit 03A nozzle A to tank return nozzle E	Jumper or manifold from nozzle A to nozzle E.	Yes		N/A		H-14-020803 SH 1	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer Route	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-101 (01/18/05)	AN-103 pump pit 103A SH Pump-007 to nozzle A Nozzle A to 3" line SH-024 valve pit AN-B nozzle R14 Valve pit AN-B nozzle R14 to nozzle R11 Valve pit AN-B nozzle R11 3" line AN03PW/AN-B to valve pit AN03 nozzle B Valve pit AN03 nozzle D to nozzle F Valve pit AN03 nozzle F to 3" line AN03PW/AN-B nozzle 15 241-AP-valve pit nozzle 15 to nozzle 18 241-AP-valve pit nozzle 18 to 3" line SH-011 to tank AP-101 pump pit D1A nozzle A	Jumper or manifold from P-007 to nozzle A 3" transfer line Jumper or manifold from nozzle R14 to nozzle R11 3" transfer line Jumper or manifold from nozzle D to nozzle F 3" transfer line Jumper or manifold from nozzle 15 to nozzle 18 3" transfer line Jumper or manifold from nozzle A to nozzle E.	Yes	No	N/A	No	H-14-020801 SH 1 H-14-080201 SH 5 U-314 alternative analysis U-314 alternative analysis U-314 alternative analysis U-314 alternative analysis U-314 alternative analysis U-314 alternative analysis H-14-020803 SH 1
	Pump pit D1A nozzle A to tank return nozzle E	Jumper or manifold from nozzle A to nozzle E.	Yes	No	N/A	No	H-14-020803 SH 1

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AH-105 to AP-102 (03/17/01) LAW feed	AH-105 pump pit 105A SH P-105 to nozzle A	Jumper or manifold from P-105 to nozzle A	No	No	No	No	H-14-020801 SH 1
	Nozzle A to 3" line SH-265 ti valve pit AH-A nozzle L16	3" transfer line	Yes	No	N/A	No	H-14-020801 SH 1
	Valve pit AH-A nozzle L16 to nozzle L11	Jumper or manifold from nozzle L16 to nozzle A	No	No	No	No	H-314 alternative analysis
	Valve pit AH-A nozzle L11 to 3" line AH03P/AH-A to valve pit AH03 nozzle C	3" transfer line	No	No	No	No	H-314 alternative analysis
	Valve pit AH03 nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E	No	No	No	No	H-314 alternative analysis
	Valve pit AH03 nozzle E to 3" line AH03P/AP04B to 241-AP-04B pit nozzle C	3" transfer line	No	No	No	No	H-314 alternative analysis
	AP-04B pump pit nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E	No	No	No	No	H-314 alternative analysis
	AP-04B pump pit nozzle E to 3" line SH-624 to tank AP-102-02B pump pit nozzle C	3" transfer line	Yes	No	M-211	No	H-14-102097 SH 1
	AP-102-02B pump pit nozzle C to nozzle A	Jumper or manifold from nozzle A to nozzle C	Yes	No	N/A	No	H-14-020803 SH 3
	AP-02B pump pit nozzle 3" line SH-622 to nozzle K AP-02A central pump pit	3" transfer line	Yes	No	N/A	No	H-14-020803 SH 3
AP-02A central pump pit nozzle A to tank return floor nozzle E	Jumper or manifold from nozzle A to floor nozzle E	No	No	M-211	No	H-14-102096 SH 1	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-105 to AP-104	AN-105 pump pit 105A SH pump P-105 to nozzle A	Jumper or manifold from P-105 to nozzle A		No		No	H-14-020801 SH 1
(03/21/01)	Nozzle A to 3" line SH-265 to valve pit AN-A nozzle L16	3" transfer line	Yes		N/A		H-14-020801 SH 1
LAW feed	Valve pit AN-A nozzle L16 to nozzle L11	Jumper or manifold from nozzle L16 to nozzle L11		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle L11 to 3" line AN03VP/AN-A to valve pit AN03 nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP04D tank AP-104-04D pump pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	AP-104-04D pump pit nozzle C to nozzle A	Jumper or manifold from nozzle C to nozzle A		No	W-211		H-14-0102097 SH 1
	AP-104-04D pump pit nozzle A to 3" line SH-625 to AP-104-04A central pump pit nozzle K	3" transfer line		No	W-211		H-14-0102097 SH 1
	AP-104-04A central pump pit nozzle K to tank return floor nozzle E	Jumper or manifold from nozzle K to nozzle E		No	W-211		H-14-102096 SH 1

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-104 to AP-104 (10/05/01) LAW feed	AN-104 pump pit 104A SH pump P-104 to nozzle A	Jumper or manifold from P-104 to nozzle A		No		No	H-14-020801 SH 1
	Nozzle A to 3" line SH-264 to valve pit AN-A nozzle L15	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L15 to nozzle L11	Jumper or manifold from nozzle L15 to nozzle L11		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle L11 to 3" line AN03VP/AN-A to valve pit AN03 nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP04D to tank AP-104-04D pump pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	AP-104-04D pump pit nozzle C to nozzle A	Jumper or manifold from nozzle A to nozzle C		No	W-211		H-14-102097 SH 1
	AP-104-04D pump pit nozzle A to 3" line SH-023 to AP-104-04A central pump pit nozzle K	3" transfer line		No	W-211		H-14-102096 SH 1
	AP-104-04A central pump pit nozzle K to floor nozzle E	Jumper or manifold from nozzle K to nozzle E		No	W-211		H-14-102096 SH 1

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AP-104 to AP-102 (10/01/01) LAW feed	AP-104 pump pit 104A SH pump P-104 to nozzle A	Jumper or manifold from P-104 to nozzle A	Yes	No	N/A	No	H-14-020801 SH 1 H-14-020801 SH 1
	Nozzle A to 3" line SH-264 to valve pit AH-A nozzle L15	3" transfer line					
	Valve pit AH-A nozzle L15 to nozzle L11	Jumper or manifold from nozzle L15 to nozzle L11		No		No	H-314 alternative analysis H-314 alternative analysis
	Valve pit AH-A nozzle L15 to nozzle L11	3" transfer line		No		No	
	Valve pit AH-A nozzle L15 to nozzle L11	Jumper or manifold from nozzle C to nozzle E		No		No	H-314 alternative analysis
	Valve pit AH-A nozzle L15 to nozzle L11	3" transfer line		No		No	
	Valve pit AH-A nozzle L15 to nozzle L11	Jumper or manifold from nozzle C to nozzle E		No		No	H-14-102097 SH 1
	Valve pit AH-A nozzle L15 to nozzle L11	3" transfer line		No		No	
	Valve pit AH-A nozzle L15 to nozzle L11	Jumper or manifold from nozzle C to nozzle E		No		No	H-14-102097 SH 1
	Valve pit AH-A nozzle L15 to nozzle L11	3" transfer line		No		No	
241-AP-104-040 pump pit nozzle E to 3" line SH-628 to 241-AP-102-020 pump pit nozzle C	Jumper or manifold from nozzle C to nozzle E		No		No		
241-AP-104-040 pump pit nozzle E to 3" line SH-628 to 241-AP-102-020 pump pit nozzle C	3" transfer line		No		No		
241-AP-102-020 pump pit nozzle C to nozzle A	Jumper or manifold from nozzle C to nozzle A		No		No		
241-AP-102-020 pump pit nozzle A to 3" line SH-622 to 241-AP-102-02A central pump pit nozzle X	3" transfer line		No		No		
241-AP-102-02A central pump pit nozzle X to tank return nozzle E	Jumper manifold nozzle X to floor nozzle E		No		No		

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-107 to AP-102 (03/21/05) LAW feed	AN-107 pump pit 107A SH pump P-019 to nozzle A	Jumper or manifold from P-019 to nozzle A	Yes		N/A		H-14-020801 SH 1
	Nozzle A to 3" line SN-267 to valve pit AN-A nozzle L1	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L1 to nozzle L11	Jumper or manifold from nozzle L1 to nozzle L11		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle L11 to 3" line AN03VP/AN-A to valve pit AN03 nozzle B	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP040 to 241-AP-104-04D pump pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	241-AP-104-04D pump pit nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E		No	W-211		H-14-102097 SH 1
	241-AP-104-04D pump pit nozzle E to 3" line SN-624 to 241-AP-102-02D pump pit nozzle C	3" transfer line		No	W-211		H-14-102097 SH 1
	241-AP-102-02D pump pit nozzle C to nozzle A	Jumper or manifold from nozzle A to nozzle C		No	W-211		H-14-102097 SH 1
	241-AP-102-02D pump pit nozzle A to 3" line SN-622 to 241-AP-102-02A central pump pit nozzle K	3" transfer line		No	W-211		H-14-102096 SH 1
241-AP-102-02A central pump pit nozzle K to floor nozzle E	Jumper manifold from nozzle K to nozzle E		No	W-211		H-14-102096 SH 1	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-107 to AP-104 (03/24/05) LAW feed	AN-107 pump pit 107A SN P-019 to nozzle A	Jumper or manifold from P-019 to nozzle A		No		No	H-14-020801 SH 1
	Nozzle A to 3" line SN-267 to valve pit AN-A nozzle L1	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L1 to nozzle L11	Jumper or manifold from nozzle L1 to nozzle L11		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle A to 3" line AN03VP/AN-A to valve pit AN03 nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP04D to 241-AP-104-04D pump pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	241-AP-104-04D pump pit nozzle C to nozzle A	Jumper or manifold from nozzle A to nozzle C		No	W-211		H-14-102097 SH 1
	241-AP-104-04D pump pit nozzle A to 3" line SN-623 to 241-AP-104-04A central pump pit nozzle K	3" transfer line		No	W-211		H-14-102096 SH 1
241-AP-104-04A central pump pit nozzle K to floor nozzle E	Jumper manifold from nozzle K to nozzle E		No	W-211		H-14-102096 SH 1	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AH-106 to AP-104 (01/01/06) LAW feed	AH-106 pump pit 106A SH pump P-016 to nozzle A	Jumper or manifold from P-016 to nozzle A		No		No	H-14-020801 SH 1
	Nozzle A to 3" line SH-266 to valve pit AN-A nozzle L14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L14 to nozzle L11	Jumper or manifold from nozzle L14 to nozzle L11		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle A to 3" line AN03VP/AN-A to valve pit AN03 nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP04D to 241-AP-104-04D pump pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	241-AP-104-04D pump pit nozzle C to nozzle A	Jumper or manifold from nozzle A to nozzle C		No	W-211		H-14-102097 SH 1
	241-AP-104-04D pump pit nozzle A to 3" line SH-623 to 241-AP-104-04A central pump pit nozzle K	3" transfer line		No	W-211		H-14-102097 SH 1
241-AP-104-04A central pump pit nozzle K to floor nozzle E	Jumper manifold		No	W-211		H-14-102096 SH 1	

Transfer	Transfer	Equipment	Equipment installed		Yes (ID or label)	Equipment Planned		References
			Yes	No		Yes (Project #)	No	
AN-106 to AP-102 (12/28/05)	LAM feed	AN-106 pump pit 106A SN P-016 to nozzle A 3" transfer line Nozzle A to 3" line SN-266 to valve pit AN-A nozzle L14	Yes	Yes	N/A	N/A	H-14-020801 SH 1 H-14-020801 SH 1	H-14-020801 SH 1 H-14-020801 SH 1
		Valve pit AN-A nozzle L14 to nozzle L11 Valve pit AN-A nozzle L14 to nozzle L11 Jumper or manifold from nozzle L14 to nozzle L11 3" transfer line pit AN03 nozzle C to nozzle E Jumper or manifold from nozzle C to nozzle E Valve pit AN03 nozzle E to 241-AP-104-04D pump pit nozzle C 241-AP-104-04D pump pit nozzle C to nozzle E 241-AP-104-04D pump pit nozzle C to nozzle E 3" transfer line	No	No	No	No	M-314 alternative analysis M-314 alternative analysis M-314 alternative analysis	H-14-102097 SH 1 H-14-102097 SH 1 H-14-102097 SH 1 H-14-102097 SH 1 H-14-102097 SH 1 H-14-102097 SH 1
		241-AP-104-04D pump pit nozzle C to nozzle E 241-AP-104-04D pump pit nozzle C to nozzle E 3" transfer line Jumper or manifold from nozzle C to nozzle E 241-AP-104-04D pump pit nozzle C to 241-AP-104-04D pump pit nozzle E Valve pit AN03 nozzle E to 3" line AN03VP/AN-A to valve L11 to 3" line pit AN03 nozzle C to nozzle E Jumper or manifold from nozzle C to nozzle E 3" transfer line	No	No	No	No	M-314 alternative analysis M-314 alternative analysis M-314 alternative analysis	H-14-102097 SH 1 H-14-102097 SH 1 H-14-102097 SH 1 H-14-102097 SH 1 H-14-102097 SH 1 H-14-102097 SH 1
		241-AP-102-02D pump pit nozzle C to nozzle A 241-AP-102-02D nozzle A to 3" line SN-622 to 3" line SN-622 to central pump pit nozzle K 241-AP-102-02A central pump pit nozzle K to floor nozzle E	No	No	No	No	M-314 alternative analysis M-314 alternative analysis M-314 alternative analysis	H-14-102097 SH 1 H-14-102097 SH 1 H-14-102096 SH 1
		Jumper or manifold from P-016 to nozzle A 3" transfer line Jumper or manifold from manifold	No	No	No	No	M-211 M-211 M-211	H-14-102097 SH 1 H-14-102097 SH 1 H-14-102097 SH 1

ALTERNATIVE 3 TRANSFER MATRIX

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-107 (10/20/08)	AN-103 pump pit 103A SH pump P-007 to nozzle A	Jumper or manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Nozzle A to 3" line SH-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R11	Jumper or manifold from nozzle R14 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle F	Jumper or manifold from nozzle D to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to 3" line AN03VP/APVP to 241-AP valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 23	Jumper or manifold from nozzle 15 to nozzle 23		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 23 to 3" line SN-617 to tank 241-AP-107--07A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 2
	241-AP-107-07A central pump pit nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 2

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-103 to AP-108	AN-103 pump pit 103A SH pump P-007 to nozzle A	Jumper or manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
(06/08/11)	Nozzle A to 3" line SN-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R11	Jumper or manifold from nozzle R14 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle A to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle F	Jumper or manifold from nozzle D to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to 3" line AN03VP/APVP to 241-AP valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 22	Jumper or manifold from nozzle 15 to nozzle 22		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 22 to 3" line SN-618 to tank 241-AP-108-08A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 4
	241-AP-108-08A central pump pit nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 4

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ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-102 to AP-108 (06/03/98)	AN-102 pump pit 102A SN P-102-1 to nozzle A	Jumper or manifold from P-102-1 to nozzle A	Yes		N/A		H-14-020801 SH 1
	Nozzle A to 3" line SN-262 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R16 to nozzle R11	Jumper or manifold from nozzle R16 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle F	Jumper or manifold from nozzle D to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to 3" line AN03VP/APVP to 241-AP valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 22	Jumper or manifold from nozzle 15 to nozzle 22		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 22 to 3" line SN-618 to 241-AP-108-08A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 4
241-AP-108-08A central pump pit nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 4	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-102 to AP-106 (06/17/11)	AN-102 pump pit 102A SN pump P-102-1 to nozzle A	Jumper or manifold from P-102-1 to nozzle A	Yes		N/A		H-14-020801 SH 1
	Nozzle A to 3" line SN-262 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R16 to nozzle R11	Jumper or manifold from nozzle R16 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle A to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle F	Jumper or manifold from nozzle D to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to 3" line AN03VP/APVP to 241-AP valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 21	Jumper or manifold from nozzle 15 to nozzle 21		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 21 to 3" line SN-616 to tank 241-AP-106-06A central pump pit nozzle A	3" transfer line		Yes		N/A	H-14-020803 SH 4
241-AP-108-08A central pump pit 06A nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E		Yes		N/A	H-14-020803 SH 4	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-102 to AP-102 (08/13/05) LAW feed (06/14/11) (Note: An alternate route would be to transfer to 241-AP valve pit to 241-AP-102-02A central pump pit.)	AN-102 pump pit 102A SN pump P-102-1 to nozzle A	Jumper or manifold from P-102-1 to nozzle A	Yes		N/A		H-14-020801 SH 1
	Nozzle A to 3" line SH-252 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R16 to nozzle R11	Jumper or manifold from nozzle R16 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle A to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle E	Jumper or manifold from nozzle D to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP04D to 241-AP-104-04D pump pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	241-AP-104-04D pump pit nozzle C to nozzle E	Jumper or manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	241-AP-104-04D pump pit nozzle E to 3" line SH-624 to 241-AP-102-02D pump pit nozzle C	3" transfer line		No	W-211		H-14-102097 SH 1
	241-AP-102-02D pump pit nozzle C to nozzle A	Jumper or manifold from nozzle A to nozzle C			W-211		H-14-102097 SH 1
	241-AP-102-02D pump pit to valve pit nozzle 19 to 3" line SH-612 to 241-AP-102-02A central pump pit nozzle A				W-211		H-14-102097 SH 1
241-AP-102-02A central pump pit nozzle A to floor nozzle E				W-211		H-14-102096 SH 1	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-102 to AP-104 (08/17/05) LAW feed	AN-102 pump pit 102A SN pump P-102-1 to nozzle A	Jumper or manifold from P-102-1 to nozzle A		No		No	H-14-020801 SH 1
	Nozzle A to 3" line SN-262 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-080201 SH 5
	Valve pit AN-B nozzle R16 to nozzle R11	Jumper or manifold from nozzle R16 to nozzle A		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle E	Jumper or manifold from nozzle D to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP04D 241-AP-104-04D pump pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	241-AP-104-04D pump pit nozzle C to nozzle A	Jumper or manifold from nozzle F to nozzle E.		No	W-211		H-14-102097 SH 1
	241-AP-104-04D pump pit nozzle A to 3" line SN-623 to 241-AP-104-04A central pump pit nozzle K	3" transfer line		No	W-211		H-14-102097 SH 1
241-AP-104-04A central pump pit nozzle K to floor nozzle E	Jumper manifold nozzle K to nozzle E		No	W-211		H-14-102096 SH 1	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-101 to AP-103 (03/02/99)	AN-101 pump pit 101A SN pump P-101-1 to nozzle A	Jumper or manifold from P-101-1 to nozzle A	Yes		N/A		H-14-020801 SH 1
	Nozzle A to 3" line SN-261 to valve pit AN-B nozzle R15	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R15 to nozzle R11	Jumper or manifold from nozzle R15 to nozzle R11		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle F	Jumper or manifold from nozzle D to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to 3" line AN03VP/APVP to 241-AP valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 17	Jumper or manifold from nozzle 15 to nozzle 17		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 17 to 3" line SN-613 to 241-AP-103-03A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 3
241-AP-103-03A central pump pit nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 3	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AP-108 to AN-105 (03/25/01)	241-AP-108-08A central pump pit SH pump P-008 to nozzle A	Jumper or manifold from P-008 to nozzle A	Yes		N/A		H-14-020803 SH 4
	Nozzle A to 3" line SH-618 to 241-AP valve pit nozzle 22	3" transfer line	Yes		N/A		H-14-020803 SH 4
	241-AP valve pit nozzle 22 to nozzle 15	Jumper or manifold from nozzle 22 to nozzle 15		No		No	W-314 alternative analysis
	241-AP valve pit nozzle 15 to 3" line AN03VP/APVP to valve pit AN03 nozzle F	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to nozzle C	Jumper or manifold from nozzle C to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle C to 3" line AN03VP/AN-A to valve pit AN-A nozzle L11	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle L11 to nozzle L16	Jumper or manifold from nozzle R11 to nozzle L16		No	W-314		H-14-020801 SH 2 (New system planned)
	Valve pit AN-A nozzle L16 to 3" line SH-265 to 241-AN-105-05A central pump pit nozzle A	3" transfer line	Yes				H-14-020801 SH 1
241-AN-105-05A central pump pit nozzle A to floor nozzle G	Jumper or manifold from nozzle A to nozzle G		No	W-211	No	H-14-020801 SH 1 TBD	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AP-107 to AN-104 (01/01/02)	241-AP-107-07A central pump pit SN pump P-007 to nozzle A	Jumper or manifold from P-007 to nozzle A	Yes		N/A		H-14-020803 SH 2
	Nozzle A to 3" line SN-617 to 241-AP valve pit nozzle 23.	3" transfer line	Yes		N/A		H-14-020803 SH 2
	241-AP valve pit nozzle 23 to nozzle 15	Jumper or manifold from nozzle 23 to nozzle 15		No		No	W-314 alternative analysis
	241-AP valve pit nozzle 15 to 3" line AN03VP/APVP to valve pit AN03 nozzle F	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to nozzle C	Jumper or manifold from nozzle C to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle C to 3" line AN03VP/AN-A to valve pit AN-A nozzle L11	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle L11 to nozzle L15	Jumper or manifold from nozzle A to nozzle L15		No	W-314		H-14-020801 SH 1 (W-314 will upgrade jumper manifold by FY2000)
	Valve pit AN-A nozzle L15 to 3" line SN-264 to 241-AN-104-04A central pump pit nozzle A	3" transfer line	Yes				H-14-020801 SH 1
241-AN-104-04A central pump pit nozzle A to floor nozzle G	Jumper or manifold from nozzle A to nozzle G		No		No	H-14-020801 SH 1	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AP-102 to AN-105 (05/13/04)	241-AP-102-020 pump pit SN pump P-002 to nozzle A	Jumper or manifold from P-002 to nozzle A		No	W-211		H-14-102097 SH 1
	241-AP-102-020 pump pit nozzle A to 3" line SN-622 to 241-AP-102-02A central pump pit nozzle K	3" transfer line	Yes		N/A		H-14-020803 SH 3
	241-AP-102-02A central pump pit nozzle K to nozzle A	Jumper or manifold from nozzle K to nozzle A		No	W-211	No	H-14-020803 SH 3
	241-AP-102-02A central pump pit nozzle A to 3" line SN-612 to 241-AP valve pit nozzle 19	3" transfer line	Yes				H-14-102097 SH 1
	241-AP valve pit nozzle 19 to nozzle 15	Jumper or manifold from nozzle 19 to nozzle 15		No		No	W-314 alternative analysis
	241-AP valve pit nozzle 15 to 3" line AN03VP/APVP to valve pit AN03 nozzle F	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle F to nozzle C	Jumper of nozzle from nozzle C to nozzle F		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle C to 3" line AN03VP/AN-A to valve pit AN-A nozzle L11	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle L11 to nozzle L16	Jumper or manifold from nozzle L11 to nozzle L16	Yes		W-314		Jumper manifold to be replaced by 2000
	Valve pit AN-A nozzle L16 to 3" line SN-265 to tank 241-AN-105-05A central pump pit nozzle A	3" transfer line		No		No	H-14-020801 SH 1
241-AN-105-05A central pump pit nozzle A to floor nozzle G	Jumper or manifold from nozzle A to nozzle G		No	W-211		H-14-102096 SH 1	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AP-104 to AN-105 (05/14/04)	241-AP-104-04D pump pit pump WT-P-002 to nozzle C	Jumper or manifold from pump WT-P-002 to nozzle C		No	W-211		H-14-102097 SH 1
	241-AP-104-04D pump pit nozzle C to 3" line AN03VP/AP04D to valve pit AN03 nozzle E	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to nozzle C	Jumper or manifold from nozzle E to nozzle C		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle C to 3" line AN03VP/AN-A to valve pit AN-A nozzle L11	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle L11 to nozzle L16	Jumper or manifold from nozzle L11 to nozzle L16.		No		No	W-314 alternative analysis
	Valve pit AN-A nozzle L16 to 3" line SN-265 to 241-AN-105-05A central pump pit nozzle A	3" transfer line	Yes				H-14-020801 SH 1
241-AN-105-05A central pump pit nozzle A to floor nozzle G	Jumper or manifold from nozzle A to nozzle G			No	W-211		TBD

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AZ-102 to AN-105 (03/04/02) (04/25/02) (06/17/02) (08/07/02) (Decant WASH LIQUOR)	241-AZ-102-02A central pump pit W-211 decant/transfer pump to nozzle U23	Jumper or manifold from decant/transfer pump to nozzle U23		No	W-211 and W-314		ES-314E-M40
	241-AZ-102-02A central pump pit nozzle U23 to 3" line SN-630 to valve pit AN-B nozzle R1	3" transfer line		No	W-314		ES-314E-M40
	Valve pit AN-B nozzle R1 to nozzle R19	Jumper or manifold from nozzle R1 to nozzle R19		No	W-314		ES-314E-M40
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L16	Jumper or manifold from nozzle L19 to nozzle L16		No	W-314		ES-314E-M40
	Valve pit AN-A nozzle L16 to 3" line SN-265 to tank 241-AN-105-05A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 1
	241-AN-105-05A central pump pit nozzle A to floor nozzle G	Jumper or manifold from nozzle A to nozzle G		No	W-211	No	H-14-020801 SH 1 TBD

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AZ-102 to AN-104 (01/12/02) Complete supernate decant of Envelope D	241-AZ-102-02A central pump pit decant/transfer pump to nozzle U23	Jumper or manifold from decant/transfer pump to nozzle U23		No	W-211 and W-314		ES-314E-M40
	241-AZ-102-02A central pump pit nozzle U23 to 3" line SN-630 to valve pit AN-B nozzle R1	3" transfer line		No	Yes (W-314)		ES-314E-M40
	Valve pit AN-B nozzle R1 to nozzle R19	Jumper or manifold from nozzle R1 to nozzle R19		No	W-314		ES-314E-M40
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper or manifold from nozzle L19 to nozzle L15		No	W-314		ES-314E-M40
	Valve pit AN-A nozzle L15 to 3" line SN-264 to tank 241-AN-104-04A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 1
	241-AN-104-04A central pump pit nozzle A to floor nozzle G	Jumper or manifold from nozzle A to nozzle G		No	W-211		TBD

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AY-102 to AN-105 (03/26/05) Initial Decant 2AY/6C (05/25/05) First decant wash liquor (07/17/05) Second decant wash liquor Supernate decant transfers not covered by this evaluation: February 27, 1998 February 27, 1998 February 27, 1998 February 27, 1998	241-AY-102-02A central pump pit W-211 decant/transfer pump to nozzle U13	Jumper or manifold from decant/transfer pump to nozzle U5		No	W-211		TBD
	241-AY-102-02A central pump pit nozzle U5 to 3" line AY02A/AZ02A to tank 241-AZ-102-02A central pump pit nozzle U22	3" transfer line		No		No	W-314 alternative analysis
	241-AZ-102-02A central pump pit nozzle U22 to nozzle U23	Jumper or manifold from nozzle U22 to nozzle U23		No	W-314		ES-314E-M40
	241-AZ-102-02A central pump pit nozzle U23 to 3" line SN-630 to valve pit AN-B nozzle R1	3" transfer line		No	W-314		ES-314E-M40
	Valve pit AN-B nozzle R1 to nozzle R19	Jumper or manifold from nozzle R1 to nozzle R19	Yes	No	W-314		H-14-020801 SH 5
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line			N/A		ES-314E-M40
	Valve pit AN-A nozzle L19 to nozzle L16	Jumper or manifold from nozzle L19 to nozzle L16		No	W-314		H-14-020801 SH 1
	Valve pit AN-A nozzle L16 to 3" line SN-265 to 241-AN-105-05A central pump pit nozzle A	3" transfer line			N/A	No	H-14-020801 SH 1
	241-AN-105-05A central pump pit nozzle A to floor nozzle G	Jumper or manifold from nozzle A to nozzle G		No	W-211		TBD

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AZ-101 to AW-105 (10/10/00) First decant of wash liquor (11/30/00) Second decant of wash liquor (01/21/01) Third decant of wash liquor	241-AZ-101-01A central pump pit W-211 decant/transfer pump to nozzle U10	Jumper or manifold from decant/transfer pump to nozzle U10		No	W-211		TBD
	241-AZ-101-01A central pump pit nozzle U10 to line 3" SN-631 to AZ-102 pump pit AZ-02A nozzle U18	3" transfer line		No	AZ-101 sludge washing upgrade		ES-314E-W40
	241-AZ-102-02A central pump pit nozzle U18 to nozzle U23	Jumper or manifold from nozzle U18 to nozzle U23		No	W314		ES-314E-W40
	241-AZ-102-02A central pump pit nozzle U23 to 3" line SN-630 to 241-AN-B valve pit nozzle R1.	3" transfer line		No	W314		ES-314E-W40
	241-AN-B valve pit nozzle R1 to nozzle R12	Jumper or manifold from nozzle R1 to R12		No	W314		
	241-AN-B valve pit nozzle R12 to 3" line AN03VP/AN-A to AN03 valve pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	AN03 valve pit nozzle C to nozzle F	Jumper manifold nozzle C to nozzle F		No		No	W-314 alternative analysis
	AN03 valve pit nozzle F to 3" line AN03/APVP to 241-AP valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP valve pit nozzle 15 to nozzle 13	Jumper manifold nozzle 13 to nozzle 15		No		No	W-314 alternative analysis
	241-AP valve pit nozzle 13 to 3" line SN-609 to 241-AW-102-02A central pump pit nozzle V	3" transfer line	Yes				ES-314E-W40
	241-AW-102-02A central pump pit nozzle V to nozzle J	Jumper manifold nozzle V to nozzle J	Yes				ES-314E-W40
	241-AW-102-02A central pump pit nozzle J to 3" line SN-267 to 241-AW-A valve pit nozzle L1	3" transfer line	Yes				ES-314E-W40

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AZ-101 to AW-105 CONTINUED	241-AW-A valve pit nozzle L1 to nozzle L15	Jumper manifold nozzle L1 to nozzle L15		No	W-314 OR W-454		ES-314E-M40
	241-AW-A valve pit nozzle L15 to 3" line SN-265 to 241-AW-105-05A central pump pit nozzle A	3" transfer line	Yes				ES-314E-M40
	241-AW-105-05A central pump pit nozzle A to floor nozzle G	Jumper manifold nozzle A to nozzle G		No	W-211		TBD
AW-106 to AP-101 (12/01/98) (04/03/99)	241-AW-106-06A central pump pit SN pump P-017 to nozzle A	Pump and Jumper manifold from P-017 to nozzle A		No		No	H-14-020802 SH 3
	Nozzle A to 3" line SN-266 to 241-AW-B valve pit nozzle R15	3" transfer line	Yes		N/A		H-14-020802 SH 3
	241-AW-B valve pit nozzle R15 to nozzle R1	Jumper or manifold from nozzle R15 to nozzle R1	Yes		N/A		Routing Board
	241-AW-B valve pit nozzle R1 to 3" line SN-268 to 241-AW-102-02A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020802 SH 5
	241-AW-102-02A central pump pit nozzle H to nozzle U	Jumper or manifold from nozzle H to nozzle U	Yes		N/A		H-14-020802 SH 2
	241-AW-102-02A central pump pit nozzle U to 3" line SN-610 to 241-AP valve pit nozzle 13	3" transfer line	Yes		N/A		H-14-020802 SH 2
	241-AP valve pit nozzle 13 to nozzle 18	Jumper or manifold from nozzle 14 to nozzle 18	Yes		N/A		H-14-020803 Sh 5
	241-AP valve pit nozzle 18 to 3" line SN-611 to 241-AP-101-01A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020803 Sh 5
	241-AP-101-01A central pump pit nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 Sh 1

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AW-106 to AP-107 (09/14/00) (11/03/00)	241-AW-106-06A central pump pit SN pump P-017 to nozzle A	Jumper or manifold from P-017 to nozzle A		No		No	H-14-020802 SH 3
	241-AW-106-06A central pump pit nozzle A to 3" line SN-266 to 241-AW-B valve pit nozzle R15	3" transfer line	Yes		N/A		H-14-020802 SH 3
	241-AW-B valve pit nozzle R15 to nozzle R1	Jumper or manifold from nozzle R15 to nozzle R1	Yes		N/A		H-14-020802 SH 5
	241-AW-B valve pit nozzle R1 to 3" line SN-268 to 241-AW-102-02A central pump pit nozzle H	3" transfer line	Yes		N/A		H-14-020802 SH 2
	241-AW-102-02A central pump pit nozzle H to nozzle U	Jumper or manifold from nozzle H to nozzle U	Yes		N/A		H-14-020802 SH 2
	241-AW-102-02A central pump nozzle U to 3" line SN-610 to 241-AP-valve pit nozzle 13	3" transfer line	Yes		N/A		H-14-020802 SH 2
	241-AP-valve pit nozzle 13 to nozzle 23	Jumper or manifold from nozzle 13 to nozzle 23	Yes		N/A		H-14-020803 SH 5
	241-AP-valve pit nozzle 23 to 3" line SN-617 to 241-AP-107-07A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 5
	241-AP-107-07A central pump pit nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 2

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AW-106 to AP-105 (06/03/98)	241-AW-106-06A central pump pit Sn pump P-017 to nozzle A	Pump and jumper manifold from P-017 to nozzle A		No		No	H-14-020802 SH 3
	241-AW-106-06A central pump pit nozzle A to 3" line SN-266 to 241-AW-B valve pit nozzle R15	3" transfer line	Yes		N/A		H-14-020802 SH 3
	241-AW-B valve pit nozzle R15 to nozzle R1	Jumper or manifold from nozzle R15 to nozzle R1	Yes		N/A		H-14-020802 SH 6
	241-AW-B valve pit nozzle R1 to 3" line SN-268 to 241-AW-102-02A central pump pit nozzle H	3" transfer line	Yes		N/A		H-14-020802 SH 6
	241-AW-102-02A central pump pit nozzle H to nozzle U	Jumper or manifold from nozzle H to nozzle U	Yes		N/A		H-14-020802 SH 2
	241-AW-102-02A central pump pit nozzle H to 3" line SN-610 to 241-AP-valve pit nozzle 13	3" transfer line	Yes		N/A		H-14-020802 SH 2
	241-AP-valve pit nozzle 13 to nozzle 24	Jumper or manifold from nozzle 13 to nozzle 24	Yes		N/A		H-14-020803 SH 5
	241-AP-valve pit nozzle 24 to 3" line SN-615 to 241-AP-05A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 5
	241-AP-105-05A central pump pit nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 2

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Equipment	Equipment Installed		Equipment Planned	References
		Yes (ID or label)	No		
AW-106 to AP-107 (10/10/98)	Transfer	Yes	No	No	H-14-020802 SH 3 H-14-020802 SH 4 H-14-020802 SH 2 H-14-020802 SH 2 H-14-020802 SH 2 H-14-020802 SH 2 H-14-020802 SH 4 H-14-020802 SH 3 H-14-020802 SH 3
	Equipment	Yes (Pump failed)	No	No	
241-AW-104-06A central pump pit nozzle A to nozzle A	Pump and jumper manifold from P-011 to nozzle A	Yes	No	No	
241-AW-104-06A central pump pit nozzle A to 3" line SN-266 to 241-AW-B valve pit nozzle R14	3" transfer line	Yes	No	No	
241-AW-B valve pit nozzle R14 to nozzle R14	Jumper or manifold from nozzle R14 to nozzle R1	Yes	No	No	
241-AW-B valve pit nozzle R14 to nozzle R1	3" transfer line	Yes	No	No	
241-AW-B valve pit nozzle R14 to nozzle R1	Jumper or manifold from nozzle R14 to nozzle R1	Yes	No	No	
241-AW-102-02A central pump pit nozzle H to nozzle H	Jumper or manifold from nozzle H to nozzle U	Yes	No	No	
241-AW-102-02A central pump pit nozzle U to 3" line SN-610 to 241-AP- valve pit nozzle 14	3" transfer line	Yes	No	No	
241-AP-valve pit nozzle 14 to nozzle 23	Jumper or manifold from nozzle 14 to nozzle 23	Yes	No	No	
241-AP-valve pit nozzle 23 to 3" line SN-617 to AP-107 pump pit-AP-07A nozzle A	3" transfer line	Yes	No	No	
241-AP-107-07A central pump pit nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E	Yes	No	No	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AP-101 to AP-103 (08/06/98)	241-AP-101-01A central pump pit SN pump P-001 to nozzle A	Pump and jumper manifold from P-001 to nozzle A	Yes		M/A		H-14-020803 SH 1
	241-AP-101-01A nozzle A to 3" line SH-611 to 241-AP-valve pit nozzle 10	3" transfer line	Yes		M/A		H-14-020803 SH 1
	241-AP-valve pit nozzle 10 to nozzle 14	Jumper manifold from nozzle 10 to nozzle 14	Yes		N/A		H-14-020803 SH 5
	241-AP-valve pit nozzle 14 to 3" line SH-609 to 241-AM-102-02A central pump pit nozzle V	3" transfer line	Yes		M/A		H-14-020803 SH 5
	241-AM-102-02A central pump pit nozzle V to nozzle J	Jumper or manifold from nozzle V to nozzle J	Yes		M/A		H-14-020802 SH 2
	241-AM-102-02A central pump pit nozzle J to 3" line SH-609 to 241-AM-A valve pit nozzle L1	3" transfer line	Yes		M/A		H-14-020802 SH 2
	241-AM-A valve pit nozzle L1 to nozzle L14	Jumper manifold from nozzle L1 to nozzle L14		No		No	H-14-020802 SH 4
	241-AM-A valve pit nozzle L14 to 3" line SH-253 to 241-AM-103-03A central pump pit nozzle A	3" transfer line	Yes		M/A		H-14-020802 SH 4
	241-AM-103-03A central pump pit nozzle A to floor nozzle 0	Jumper manifold from nozzle A to nozzle 0	Yes		M/A		H-14-020802 SH 3

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AP-106 to AW-102 (10/02/00) Empty 6AP (10/05/00) Empty 6AP (10/06/00) Empty 6AP (10/07/00) Empty 6AP (10/08/00) Empty 6AP (02/07/01)	241-AP-106-06-A central pump pit SN pump P-006 to nozzle A	Pump and jumper manifold from P-006 to nozzle A	Yes		N/A		H-14-020803 SH 4
	241-AP-106-06A central pump pit nozzle A to 3" line SN-616 to 241-AP-valve pit nozzle 21.	3" transfer line	Yes		N/A		H-14-020803 SH 4
	241-AP-valve pit nozzle 21 to nozzle 14	Jumper manifold from nozzle 21 to nozzle 14	Yes		N/A		H-14-020803 SH
	241-AP-valve pit nozzle 14 to 3" line SN-609 to 241-AW-102-02A central pump pit nozzle V	3" transfer line	Yes		N/A		H-14-020802 SH 2
	241-AW-102-02A central pump pit nozzle V to floor nozzle L	Jumper manifold from nozzle V to nozzle L	Yes				H-14-020802 SH 2
AP-103 to AW-102 (07/01/99)	241-AP-103-03A central pump pit SN pump P-003 to nozzle A	Pump and jumper manifold from P-003 to nozzle A	Yes		N/A		H-14-020803 SH 1
	2431-AP-103-03A central pump pit nozzle A to 3" line SN-613 to 241-AP-valve pit nozzle 17	3" transfer line	Yes		N/A		H-14-020803 SH 4
	241-AP-valve pit nozzle 17 to nozzle 14	Jumper manifold from nozzle 17 to nozzle 14	Yes		N/A		H-14-020803 SH 5
	241-AP-valve pit nozzle 14 to 3" line SN-609 to 241-AW-102-02A central pump pit nozzle V	3" transfer line	Yes		N/A		H-14-020803 SH 5
	Pump pit-AW-02A nozzle V to tank return nozzle L	Jumper or manifold from nozzle V to nozzle L	Yes		N/A		H-14-020802 SH 2

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AP-107 to AW-102 (04/25/98)	241-AP-107-07A central pump pit SH pump P-007 to nozzle A	Pump and jumper from P-007 to nozzle A	Yes		N/A		H-14-020803 SH 2
	241-AP-107-07A central pump pit Nozzle A to 3" line SH-617 to 241-AP-valve pit nozzle 23	3" transfer line	Yes		N/A		H-14-020803 SH 2
	241-AP-valve pit nozzle 23 to nozzle 14	Jumper manifold from nozzle 23 to nozzle 14	Yes		N/A		H-14-020803 SH 5
	241-AP-valve pit nozzle 14 to 3" line SH-609 to 241-AW-102-02A central pump pit nozzle V	3" transfer line	Yes		N/A		H-14-020803 SH 5
	241-AW-102-02A central pump pit nozzle V to floor nozzle L	Jumper manifold from nozzle V to nozzle L	Yes		N/A		H-14-020802 SH 2
AP-104 to AW-102 (03/01/98)	241-AP-104-04A central pump pit SH pump P-004 to nozzle A	Pump and jumper manifold from P-004 to nozzle A	Yes		N/A		H-14-020803 SH 3
	241-AP-104-04A central pump pit nozzle A to 3" line SH-614 to 241-AP valve pit nozzle 20	3" transfer line	Yes		N/A		H-14-020803 SH 3
	241-AP valve pit nozzle 20 to nozzle 14	Jumper manifold from nozzle 20 to nozzle 14	Yes		N/A		H-14-020803 SH 5
	241-AP-valve pit nozzle 14 to 3" line SH-609 to 241-AW-102-02A central pump pit nozzle V	3" transfer line	Yes		N/A		H-14-020803 SH 5
	241-AW-102-02A central pump pit nozzle V to floor nozzle L	Jumper or manifold from nozzle V to nozzle L	Yes		N/A		H-14-020802 SH 2

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AW-101 to AP-104	241-AW-101-01A central pump pit SH pump P-001 to nozzle A	Pump and jumper or manifold from P-001 to nozzle A		No	Yes (W-211)		WHC-SD-W211-TDR-001
	Nozzle A to 3" line SH-261 to 241-AW-A valve pit nozzle L16	3" transfer line	Yes		N/A		H-14-020802 SH 1
	241-AW-A valve pit nozzle L16 to nozzle L1	Jumper manifold from nozzle L16 to nozzle L1		No		No	H-14-020802 SH 4
	241-AW-A valve pit nozzle L1 to 3" line SH-267 to 241-AW-102-02A central pump pit nozzle J	3" transfer line	Yes		N/A		H-14-020802 SH 4
	241-AW-102-02A central pump pit nozzle J to nozzle V	Jumper manifold from nozzle J to nozzle V	Yes		N/A		H-14-020802 SH 2
	241-AW-102-02A central pump pit nozzle V to 3" line SH-609 to 241-AP valve pit nozzle 14	3" transfer line	Yes		N/A		H-14-020802 SH 2
	241-AP valve pit nozzle 14 to nozzle 20	Jumper manifold from nozzle 14 to nozzle 20	Yes		N/A		H-14-020802 SH 2
	241-AP valve pit nozzle 20 to 3" line SH-614 to 241-AP-104-04A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020802 SH 2
Pump pit-AP-04A nozzle A to floor nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 5	

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Transfer	Ap-101 to AM-104	(10/21/98)	Transfer	261-AP-101-01A central pump pit nozzle A to nozzle A	Equipment	Equipment Installed		Equipment Planned	References
						Yes (ID or label)	No		
Transfer	Ap-101 to AM-104	(10/21/98)	Transfer	261-AP-101-01A central pump pit nozzle A to nozzle A	Equipment	Yes	No	N/A	H-14-020803 SH 1
					Needs	Yes	No	N/A	H-14-020803 SH 1
					Transfer	Yes	No	N/A	H-14-020803 SH 5
					Transfer	Yes	No	N/A	H-14-020803 SH 5
					Transfer	Yes	No	N/A	H-14-020803 SH 5
					Transfer	Yes	No	N/A	H-14-020802 SH 2
					Transfer	Yes	No	N/A	H-14-020802 SH 2
					Transfer	Yes	No	N/A	H-14-020802 SH 5
					Transfer	Yes	No	N/A	H-14-020802 SH 5
					Transfer	Yes	No	N/A	H-14-020802 SH 3

ALTERNATIVE 3 TRANSFER MATRIX

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AW-101 to AP-102 (01/09/03)	241-AW-101-01A central pump pit SN pump P-001 to nozzle A	Pump and jumper manifold from P-001 to nozzle A		No	Yes (W-211)		WRC-SD-w211-TDR-001
	241-AW-101-01A central pump pit nozzle A to 3" line SN-261 to 241-AW-A valve pit nozzle L16	3" transfer line	Yes		N/A		H-14-020802 SH 1
	241-AW-A valve pit nozzle L16 to nozzle L1	Jumper manifold from nozzle L16 to nozzle L1		No	(W-314 or W454)	No	H-14-020802 SH 4
	241-AW-A valve pit nozzle L1 to 3" line SN-267 to 241-AW-102-02A central pump pit nozzle J	3" transfer line	Yes		N/A		H-14-020802 SH 4
	241-AW-102-02A central pump pit nozzle J to nozzle V	Jumper manifold from nozzle J to nozzle V	Yes		N/A		H-14-020802 SH 2
	241-AW-102-02A central pump pit nozzle V to 3" line SN-609 to 241-AP valve pit nozzle 14	3" transfer line	Yes		N/A		H-14-020802 SH 5
	241-AP valve pit nozzle 14 to nozzle 19	Jumper manifold from nozzle 14 to nozzle 19	Yes		N/A		H-14-020802 SH 5
	241-AP valve pit nozzle 19 to 3" line SN-612 to 241-AP-102-02A central pump pit nozzle A	3" transfer line	Yes		N/A		H-14-020802 SH 5
241-AP-102-02A central pump pit nozzle A to floor nozzle E	Jumper or manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 3	

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AY-101 to AP-102 (05/15/04) LAW Feed	241-AY-101-01A central pump pit SN pump P-101-1 to nozzle U13	Pump and Jumper manifold from pump to nozzle U13	Pump is currently located in 01D and may not be suitable for this transfer	No	(Operational replacement)	No	TBD
	241-AY-101-01A central pump pit nozzle U13 to 3" line SN-635 to 241-AY-102-02A central pump pit nozzle U12	3" transfer line		No	Yes(W-314)		ES-314E-M40
	241-AY-102-02A central pump pit nozzle U12 to nozzle U5	Jumper manifold from nozzle U12 to nozzle U5		No	W-314		ES-314E-M40
	241-AY-102-02A central pump pit nozzle U5 to 3" line AV02A/AZ02A to 241-AZ-102-02A central pump pit nozzle U22	3" transfer line		No		No	W-314 alternative analysis
	241-AZ-102-02A central pump pit nozzle U22 to nozzle U23	Jumper manifold from nozzle U22 to nozzle U23		No	Yes(W-314)		ES-314E-M40
	241-AZ-102-02A central pump pit nozzle U23 to 3" line SN-630 to 241-AN-B valve pit nozzle R1	3" transfer line		No	Yes(W-314)		ES-314E-M40
	241-AN-B valve pit nozzle R1 to nozzle R11	Jumper manifold from nozzle R1 to nozzle R11		No		No	W-314 alternative analysis
	241-AN-B valve pit nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle E	Jumper manifold from nozzle D to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP04D to 241-AP-104-04D pump pit nozzle C	3" transfer line		No		No	W-314 alternative analysis
	241-AP-104-04D pump pit nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No	W-211		H-14-102097 SH 1
	241-AP-104-04D pump pit nozzle E to 3" line SN-624 to 241-AP-102-02D pump pit nozzle C	3" transfer line		No	W-211		H-14-102097 SH 1

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AY-101 to AP-102	241-AP-102-02D pump pit nozzle C to nozzle A	Jumper manifold nozzle C to nozzle A		No	W-211		H-14-102097 SH 1
LAW Feed (continued)	241-AP-102-02D pump pit nozzle A to 3" line SH-622 to 241-AP-102-02A central pump pit nozzle K	3" transfer line	Yes				H-14-020803 SH 3
	241-AP-102-02A central pump pit nozzle K to floor nozzle E	Jumper manifold nozzle K to nozzle E	No		W-211		H-14-102096 SH 1

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AY-101 to AP-104 (05/17/04) LAW Feed	241-AY-101-01A central pump pit transfer pump to nozzle U13	Pump and jumper manifold from Pump to nozzle U13	Pump is currently located in 01D and may not be suitable for this transfer	No	(Operational replacement)	No	ES-314E-M40
	241-AY-101-01A central pump pit nozzle U13 to 3" line SN-635 to 241-AY-102-02A central pump pit nozzle U12	3" transfer line		No	W-314	No	ES-314E-M40
	241-AY-102-02A central pump pit nozzle U12 to nozzle U5	Jumper manifold from nozzle U12 to nozzle U5		No	W-314	No	H-14-102648 SH 1
	241-AY-102-02A central pump pit nozzle U5 to 3" line AY02A/AZ02A to 241-AZ-102-02A central pump pit nozzle U22	3" transfer line		No		No	W-314 alternative analysis
	241-AZ-102-02A central pump pit nozzle U22 to nozzle U23	Jumper manifold from nozzle U22 to nozzle U23		No	W-314	No	ES-314E-M40
	241-AZ-102-02A central pump pit nozzle U23 to 3" line SN-630 to 241-AN-B valve pit nozzle R1	3" transfer line		No	W-314	No	ES-314E-M40
	Valve pit AN-B nozzle R1 to nozzle R11	Jumper or manifold from nozzle R1 to nozzle R11		No		No	W-314 alternative analysis
	241-AN-B valve pit nozzle R11 to 3" line AN03VP/AN-B to valve pit AN03 nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle D to nozzle E	Jumper manifold from nozzle D to nozzle E		No		No	W-314 alternative analysis
	Valve pit AN03 nozzle E to 3" line AN03VP/AP04D	3" transfer line		No		No	W-314 alternative analysis
	241-AP-104-04D pump pit nozzle C						
	241-AP-104-04D pump pit nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
	241-AP-104-04D pump pit nozzle A to 3" line SN-623 to 24-AP-104-04A central pump pit nozzle K	3" transfer line		No	W-211	No	H-14-102097 SH 1

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ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AZ-102 to AY-101 (01/01/02) LAW Feed decanted supernate Envelope B	241-AZ-102-02A central pump pit transfer pump to nozzle U22	Jumper or manifold from P-102-1 to nozzle U22		No	W-211		ES-314E-W40
	241-az-102-02A central pump pit nozzle U22 to 3" line AY02A/AZ02A to 241-AY-02A central pump pit nozzle U5	3" transfer line		No		No	W-314 alternative analysis
	241-AY-102-02A central pump pit nozzle U5 to nozzle U12	Jumper manifold from nozzle U5 to nozzle U12		No	W-314		ES-314E-W40
	241-AY-102-02A central pump pit nozzle U12 to 3" line SW-635 to 241-AY-101-01A central pump pit nozzle U13	3" transfer line		No	W-314		ES-314E-W40
	241-AY-101-01A central pump pit nozzle U13 to tank return riser nozzle A	Jumper manifold from nozzle U13 to tank return riser nozzle A		No	W-314		ES-314E-W40

ALTERNATIVE 3 TRANSFER MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AZ-101 to AY-101 (08/18/00) LAW Feed decanted supernatant Envelope B	241-AZ-101-01A central pump pit transfer pump to nozzle U10	Pump and jumper manifold from transfer pump to nozzle U10		No	AZ-101 Sludge Wash Upgrade	No	ES-314E-H40
	241-AZ-101-01A central pump pit nozzle U10 to 3" line SH-631 to 241-AZ-102-02A central pump pit nozzle U18	3" transfer line		No	W-314		ES-314E-H40
	241-AZ-102-02A central pump pit nozzle U18 to 3" pit nozzle U22	Jumper manifold from nozzle U18 to nozzle U22		No	M314		ES-314E-H40
	241-AZ-102-02A central pump pit nozzle U22 to 3" line SH-632 to 241-AY-102-02A nozzle U5	3" transfer line		No			W-314 alternative analysis
	241-AY-102-02A central pump pit nozzle U5 to nozzle U12	Jumper manifold from nozzle U5 to nozzle U12		No		No	ES-314E-H40
	241-AY-102-02A central pump pit nozzle U5 to nozzle U15	3" transfer line		No	W-314		ES-314E-H40
	241-AY-101-01A central pump pit nozzle U12 to 3" line SH-635 to 241-AY-101-01A central pump pit nozzle U15	Jumper or manifold from nozzle U12 to tank return riser		No	W-314		ES-314E-H40
	241-AY-101-01A central pump pit nozzle U15 to nozzle A	Jumper or manifold from riser nozzle A		No			ES-314E-H40

EQUIPMENT AVAILABILITY MATRIX

Transfer	Transfer Nozzle	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AP-101 to AP-103 (1999)	AP-101 pump pit AN-101A SH pump P-101-1 to nozzle D	Pump and Jumper manifold from P-101-1 to nozzle D	No	No	No	No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN01A/AP/D to 241-AP-valve pit nozzle 15	3" transfer line	No	No	No	No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 17	Jumper manifold from nozzle 15 to nozzle 17	Yes	No	N/A	No	W-314 alternative analysis R-14-020803 SH 1
	241-AP-valve pit nozzle 17 to 3" line SH-015 to AP-103 pump pit AP-03A nozzle A	3" transfer line	Yes	No	N/A	No	R-14-020803 SH 1
	Pump pit AP-03A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes	No	N/A	No	R-14-020803 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-105 to AP-102 (2001)	AN-105 pump pit AN-105A SH pump P-105 to nozzle A	Pump and Jumper manifold from P-105 to nozzle A	No	No	No	No	H-14-020801 SH 1
	Pump pit AN-105A nozzle A to nozzle 3" line SN-265 to valve pit AN-A nozzle L16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L16 to nozzle L15	Jumper manifold from nozzle L16 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3" line SN-264 pump pit AN-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN05A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle E to 3" line SN-62A to pump pit AP-02D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-02D nozzle C to tank return nozzle A	Jumper manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Pump pit AP-02D nozzle A to 3" line SN-622 to pump pit AP-02K nozzle K	3" transfer line	Yes		N/A		H-14-020803 SH 3
	Pump pit AP-02A nozzle K to tank return nozzle E	Jumper manifold from nozzle K to nozzle E		No		No	W-314 alternative analysis

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-105 to AP-104 (2001)	AN-105 pump pit AN-105A SN pump P-105 to nozzle A	Pump and jumper manifold from P-105 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-105A nozzle A to nozzle 3" line SN-265 to valve pit AN-A nozzle L16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L16 to nozzle L15	Jumper manifold from nozzle L16 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3" line SN-264 to pump pit AN-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN04A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle A to 3" line SH-623 to pump pit AP-04A nozzle K.	3" transfer line		No		No	W-314 alternative analysis

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AH-104 to AP-102 (2001)	AH-104 pump pit AH-104A SH pump P-104 to nozzle D	Pump and jumper manifold from P-104 to nozzle D		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle D to 3" line AH04A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle E to 3" line SH-624 to pump pit AP-02D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-02D nozzle C to tank return nozzle A	Jumper manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Pump pit AP-02D nozzle A to 3" line SH-622 to pump pit AP-02A nozzle K	3" transfer line	Yes		N/A		H-14-020803 SH 3
	Pump pit AP-02A nozzle K to tank return nozzle E	Jumper manifold from nozzle K to nozzle E		No		No	W-314 alternative analysis
AH-104 to AP-104 (2001)	AH-104 pump pit AH-104A SH pump P-104 to nozzle D	Pump and jumper manifold from P-104 to nozzle D		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle D to 3" line AH04A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle A to 3" line SH-623 to pump pit AP-04A nozzle K	3" transfer line		No		No	W-314 alternative analysis

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-103 to AP-102 (2003)	AN-103 pump pit AN-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SN-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R19	Jumper manifold from nozzle R14 to nozzle R19		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3" line SN-264 to pump pit AN-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN04A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle E to 3" line SN-624 to pump pit AP-02D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-02D nozzle C to tank return nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
	Pump pit AP-02D nozzle A to 3" line SN-622 to pump pit AP-02A nozzle K	3" transfer line	Yes		N/A		H-14-020803 SH 3
	Pump pit AP-02A nozzle K to tank return nozzle E	Jumper manifold from nozzle K to nozzle E		No		No	W-314 alternative analysis

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AH-103 to AP-104 (2003)	AH-103 pump pit AH-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AH-103A nozzle A to 3" line SN-263 to valve pit AH-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AH-B nozzle R14 to nozzle R19	Jumper manifold from nozzle R14 to nozzle R19		No		No	H-14-020801 SH 6
	Valve pit AH-B nozzle R19 to 3" line SN-268 to valve pit AH-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L15 to 3" line SN-264 to pump pit AH-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AH-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle D to 3" line AH06A/AP040 to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle A to 3" line SN-623 to pump pit AP-06A nozzle K	3" transfer line		No		No	W-314 alternative analysis

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Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References.
			Yes (ID or label)	No	Yes (Project #)	No	
AN-103 to AP-105 (2005)	AN-103 pump pit AN-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SH-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SH-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN01A/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 24	Jumper manifold from nozzle 15 to nozzle 24		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 24 to 3" line SH-615 to tank AP-105 pump pit AP-05A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 2
Pump pit AP-05A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 2	

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Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AH-103 to AP-103 (2005)	AN-103 pump pit AH-103A SN pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SN-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SN-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN01A/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 17	Jumper manifold from nozzle 15 to nozzle 17		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 17 to 3" line SN-613 to tank AP-103 pump pit AP-03A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 1
Pump pit AP-03A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 1	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-101 (2005)	AN-103 pump pit AN-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SH-263 to valve pit AN-8 nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-8 nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-8 nozzle R15 to 3" line SH-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN01A/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 18	Jumper manifold from nozzle 15 to nozzle 18		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 18 to 3" line SH-011 to tank AP-101 pump pit AP-01A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 1
	Pump pit AP-01A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 1

References	Equipment Planned		Equipment Installed		Equipment Needs	Route	Transfer
	Yes (Project #)	No	Yes (ID or Label)	No			
H-14-020801 SH 1	No	No	No	No	AP-107 pump pit AH-107A SH pump P-019 to nozzle A	AP-107 to AP-102 (2005)	
H-14-020801 SH 1	No	N/A	No	No	3" transfer line	Pump pit AH-107A nozzle A to nozzle 3" line SH- 267 to valve pit AH-A nozzle L1	
H-14-020801 SH 5	No	N/A	No	No	3" transfer line	Valve pit AH-A nozzle L1 to nozzle L15	
H-14-020801 SH 5	No	N/A	No	No	3" transfer line	Valve pit AH-A nozzle L15 to 3" line SH-266 nozzle A	
H-314 alternative analysis	No	No	No	No	3" transfer line	Pump pit AH-104A nozzle A to nozzle B	
H-314 alternative analysis	No	No	No	No	3" transfer line	Pump pit AH-104A nozzle D to 3" line AN04A/AP04D to tank AP- 104 pump pit 04D nozzle C	
H-314 alternative analysis	No	No	No	No	3" transfer line	Pump pit AP-04D nozzle E to nozzle E	
H-314 alternative analysis	No	No	No	No	3" transfer line	Pump pit AP-04D nozzle E to 3" line SH-626 to pump pit AP-02D nozzle C	
H-314 alternative analysis	No	No	No	No	3" transfer line	Pump pit AP-02D nozzle C to nozzle A	
H-314 alternative analysis	No	No	No	No	3" transfer line	Pump pit AP-02D nozzle C to nozzle A	
H-314 alternative analysis	No	No	No	No	3" transfer line	3" transfer line	
H-314 alternative analysis	No	No	No	No	3" transfer line	3" transfer line	
H-314 alternative analysis	No	No	No	No	3" transfer line	3" transfer line	
H-314 alternative analysis	No	No	No	No	3" transfer line	3" transfer line	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AH-107 to AP-104 (2005)	AH-107 pump pit AH-107A SN pump P-019 to nozzle A	Pump and jumper manifold from P-019 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AH-107A nozzle A to nozzle 3" line SN-267 to valve pit AH-A nozzle L1	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AH-A nozzle L1 to nozzle L15	Jumper manifold from nozzle L1 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L15 to 3" line SN-264 to pump pit AH-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit An-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle D to 3" line AH04A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle A to 3" line SN-023 to pump pit AP-04A nozzle K	3" transfer line		No		No	W-314 alternative analysis

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-102 to AP-102 (2005)	AN-102 pump pit AN-102A SH pump P-102-1 to nozzle A	Pump and jumper manifold from P-102-1 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-102A nozzle A to 3" line SN-262 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R16 to nozzle R19	Jumper manifold from nozzle R16 to nozzle R19		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3" line SN-264 to pump pit AN-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN04A/AP040 to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle E to 3" line SN-624 to pump pit AP-02D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-02D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
	Pump pit AP-02D nozzle A to 3" line SN-622 to pump pit AP-02A nozzle K	3" transfer line	Yes				H-14-020803 SH 3
	Pump pit AP-02A nozzle K to tank return nozzle E	Jumper manifold from nozzle K to nozzle E		No		No	W-314 alternative analysis

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-102 to AP-104 (2005)	AN-102 pump pit AN-102A SH pump P-102-1 to nozzle A	Pump and jumper manifold from P-102-1 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-102A nozzle A to 3" line SN-262 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R16 to nozzle R19	Jumper manifold from nozzle R16 to nozzle R19		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3" line SN-264 to pump pit AN-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN04A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
Pump pit AP-04D nozzle A to 3" line SN-623 to pump pit AP-04A nozzle K	3" transfer line		No		No	W-314 alternative analysis	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AP-106 to AP-108 (2006)	AP-106 pump pit AH-106A to nozzle 3" line SH-265 to valve pit AH-A nozzle L14	Pump and jumper manifold from P-016 to nozzle A	No	No	No	No	H-14-020801 SH 1
	Pump pit AH-106A nozzle A to nozzle 3" line SH-265 to valve pit AH-A nozzle L14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AH-A nozzle L14 to nozzle L15	Jumper manifold from nozzle L14 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L15 to 3" line SH-264 to pump pit AH-106A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AH-106A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
AP-106 to AP-108 (2006)	Pump pit AH-106A nozzle D to 3" line AH04/AP04 to tank AP-04 pump pit AP nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle A to 3" line SH-623 to pump pit AP-04A nozzle K	3" transfer line		No		No	W-314 alternative analysis

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-103 to AP-107 (2008)	AN-103 pump pit AN-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SH-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SN-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN01A/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 23	Jumper manifold from nozzle 15 to nozzle 23		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 23 to 3" line SN-617 to tank AP-107 pump pit AP-07A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 2
	Pump pit AP-07A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 2

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AH-103 to AP-103 (2011)	AN-103 pump pit AN-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SN-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SN-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN01A/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 22	Jumper manifold from nozzle 15 to nozzle 22		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 22 to 3" line SN-618 to tank AP-108 pump pit AP-08A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 4
Pump pit AP-08A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 4	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-102 to AP-10B (2011)	AN-102 pump pit AN-102A	Pump and jumper manifold from P-102-1 to nozzle A		No		No	H-14-020801 SH 1
	SN pump P-102-1 to nozzle A						
	Pump pit AN-102A nozzle A to 3" line SN-252 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R16 to nozzle R15	Jumper manifold from nozzle R16 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SN-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN01A/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 22	Jumper manifold from nozzle 15 to nozzle 22		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 22 to 3" line SN-618 to tank AP-10B pump pit AP-08A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 4
Pump pit AP-08A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 4	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-102 to AP-106 (2011)	AN-102 pump pit AN-102A SH pump P-102-1 to nozzle A	Pump and jumper manifold from P-102-1 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-102A nozzle A to 3" line SN-262 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R16 to nozzle R15	Jumper manifold from nozzle R16 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SN-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D]		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN01A/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 21	Jumper manifold from nozzle 15 to nozzle 21		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 21 to 3" line SN-616 to tank AP-106 pump pit AP-06A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 4
Pump pit AP-06A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 4	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AP-108 to AN-105 (2001)	AP-108 pump pit AP-08A SH pump P-008 to nozzle A	Pump and jumper manifold from P-008 to nozzle A	Yes		N/A		H-14-020803 SH 4
	Pump pit AP-08A nozzle A to 3" line SN-618 to 241-AP-valve pit nozzle 22	3" transfer line	Yes		N/A		H-14-020803 SH 4
	241-AP-valve pit nozzle 22 to nozzle 15	Jumper manifold from nozzle 22 to nozzle 15		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to 3" line AN01A/APVP to pump pit AN-101A nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle A to 3" line SN-261 to valve pit AN-B nozzle R15	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R15 to nozzle R19	Jumper manifold from nozzle R15 to nozzle R19		No	Yes(W-314)		ES-314E-M40
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L16	Jumper manifold from nozzle L19 to nozzle L16		No	Yes(W-314)		ES-314E-M40
	Valve pit AN-A nozzle L16 to 3" line SN-265 to tank AN-105 pump pit AN-105A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 1
Pump pit An-105A nozzle A to tank return nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	H-14-020801 SH 1	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AP-102 to AN-105 (2004)	AP-102 pump pit AP-02D SN pump P-002 to nozzle C	Pump and jumper manifold from P-008 to nozzle C		No		No	W-314 alternative analysis
	Pump pit 02D nozzle C to 3" line SN-624 to pump pit AP-04D nozzle E	3" transfer line	Yes		N/A		W-314 alternative analysis
	Pump pit AP-04D nozzle E to nozzle C	Jumper manifold from nozzle E to nozzle C		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to 3" line AH104A/AP04A to pump pit AH-104A nozzle B	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle A to 3" line SN-264 to valve pit AH-A nozzle L15	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AH-A nozzle L15 to nozzle L16	Jumper manifold from nozzle L15 to nozzle L16	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L16 to 3" line SN-265 to tank AN-105 pump pit AH-105A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
Pump pit AH-105A nozzle A to tank return nozzle G	Jumper manifold from nozzle A to nozzle G		No		No	H-14-020801 SH 1	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AZ-102 to AM-105 (2002)		AZ-102 pump pit 02A SH Pump P-102-1 to nozzle U23 U23	No	No	Yes (H-314)	No	ES-314E-H40
		Pump pit 02A nozzle U23 to 3" line SH-630 to valve pit AH-B nozzle R1	No	No	Yes (H-314)	No	ES-314E-H40
		Valve pit AH-B nozzle R1 to nozzle R19 Valve pit AH-B nozzle R19 to 3" line SH-268 to valve pit AH-A nozzle L19	No	No	Yes (H-314)	No	ES-314E-H40
		Valve pit AH-A nozzle L19 to nozzle L16 Valve pit AH-A nozzle L16 to 3" line SH-265 to tank AM-105 pump pit 105A nozzle A	No	No	N/A	No	H-14-020801 SH 5
		3" transfer line 3" transfer line	Yes	Yes	N/A	No	H-14-020801 SH 1
		3" transfer line 3" transfer line	No	No	Yes (H-314)	No	ES-314E-H40
		3" transfer line 3" transfer line	No	No	Yes (H-314)	No	ES-314E-H40
		3" transfer line 3" transfer line	No	No	Yes (H-314)	No	H-14-020801 SH 1
		3" transfer line 3" transfer line	No	No	Yes (H-314)	No	H-14-020801 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AP-104 to AN-105 (2004)	AP-104 pump pit 04D W/ump P-002 to nozzle C	Pump and jumper manifold from P-002 to nozzle C		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to 3" line AN04A/AP04D to pump pit AN-104A nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle A to 3" line SN-264 to AN-A valve pit nozzle L15	3" transfer line	Yes		B/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L15 to nozzle L16	Jumper manifold from nozzle L15 to nozzle L16		No	Yes(W-314)		ES-314E-M40
	Valve pit AN-A nozzle L16 to 3" line SN-265 to tank AN-105 pump pit AN-105A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 1
Pump pit AN-105A nozzle A to tank return nozzle D	Jumper or nozzle from nozzle A to nozzle D		No		No	H-14-020801 SH 1	
AZ-102 to AN-104 (2002)	AZ-102 pump pit 02A SH pump P-102-1 to nozzle U23	Pump and Jumper manifold from P-102-1 to nozzle U23		No	Yes (W-314)		ES-314E-M40
	Pump pit 02A nozzle U23 to 3" line SN-630 to valve pit AN-B nozzle R1	3" transfer line		No	Yes (W-314)		ES-314E-M40
	Valve pit AN-B nozzle R1 to nozzle R19	Jumper manifold from nozzle R1 to nozzle R19		No	Yes (W-314)		ES-314E-M40
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15		No	Yes(W-314)		ES-314E-M40
	Valve pit AN-A nozzle L15 to 3" line SN-264 to tank AN-104 pump pit 104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 1
Pump pit 104A nozzle A to tank return nozzle G	Jumper manifold from nozzle A to nozzle G		No		No	H-14-020801 SH 1	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AZ-101 to AY-101 (2000)	AZ-101 pump pit AZ-01A SH pump P-101-1 to nozzle U10	Pump and jumper manifold from P-101-1 to nozzle U10	Yes		N/A		ES-314E-M40
	Pump pit AZ-01A nozzle U10 to 3" line SN-651 to pump pit AZ-02A nozzle U18	3" transfer line		No	Yes(W-314)		ES-314E-M40
	Pump pit AZ-02A nozzle U18 to nozzle U22	Jumper manifold from nozzle U18 to nozzle U22		No	Yes(W514)		ES-314E-M40
	Pump pit AZ-02A nozzle U22 to 3" AY02A/AZ02A to pump pit AY-02A nozzle U13	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AY-02A nozzle U13 to nozzle U12	Jumper manifold from nozzle U13 to nozzle U12		No		No	ES-314E-M40
	Pump pit AY-02A nozzle U12 to 3" line SN-635 to tank AY-101 pump pit 01A nozzle U13	3" transfer line		No	Yes(W-314)		ES-314E-M40
Pump pit AY-01A nozzle U13 to tank return nozzle	Jumper manifold from nozzle U13 to tank return nozzle		No		No	ES-314E-M40	
AZ-102 to AY-101 (2002)	AZ-102 pump pit AZ-02A SH pump P-102-1 to nozzle U22	Pump and jumper manifold from P-102-1 to nozzle U22		No		No	W-314 alternative analysis
	Pump pit AZ-02A nozzle U22 to 3" AY02A/AZ02A to pump pit AY-02A nozzle U13	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AY-02A nozzle U13 to nozzle U12	Jumper manifold from nozzle U13 to nozzle U12		No		No	ES-314E-M40
	Pump pit AY-02A nozzle U12 to 3" line SN-635 to tank AY-101 pump pit 01A nozzle U13	3" transfer line		No	Yes(W-314)		ES-314E-M40
	Pump pit AY-01A nozzle U13 to tank return nozzle	Jumper manifold from nozzle U13 to tank return nozzle		No		No	ES-314E-M40

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AH-102 to AH-105 (2005)	AH-102 pump pit 02A SH pump P-102-1 to nozzle U13	Pump and jumper manifold from P-102-1 to nozzle U13	No	No	No	No	ES-314E-H40
	Pump pit 02A nozzle U13 to 3" line AH02A/0202A transfer line to pump pit 02 nozzle U22	3" transfer line	No	No	No	No	H-314 alternative analysis
	Pump pit AH-02A nozzle U22 to nozzle U23	Jumper manifold from nozzle U22 to nozzle U23	No	No	Yes (W-314)	Yes (W-314)	ES-314E-H40
	Pump pit AH-02A nozzle U23 to 3" line SH-630 to valve pit AH-B nozzle R1	3" transfer line	No	No	Yes (W-314)	Yes (W-314)	ES-314E-H40
	Valve pit AH-B nozzle R1 to nozzle R19	Jumper manifold from nozzle R1 to nozzle R19	No	No	Yes (W-314)	Yes (W-314)	ES-314E-H40
	Valve pit AH-B nozzle R19 to 3" line SH-268 to valve pit AH-A nozzle L19	3" transfer line	Yes	Yes	N/A	N/A	H-14-020801 SH 5
	Valve pit AH-A nozzle L19 to nozzle L16	Jumper manifold from nozzle L19 to nozzle L16	No	No	Yes (W-314)	Yes (W-314)	ES-314E-H40
	Valve pit AH-A nozzle L16 to 3" line SH-630 to tank AH-105 pump pit 105A nozzle A	3" transfer line	Yes	Yes	N/A	N/A	H-14-020801 SH 1
	Pump pit 105A nozzle A to nozzle G	Jumper manifold from nozzle A to nozzle G	No	No	No	No	H-14-020801 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AZ-101 to AW-105 (2000)	AZ-101 pump pit AZ-01A pump P-101-1 to nozzle U6	Pump and jumper manifold from P-101-1 to nozzle U6		No		No	W-314 alternative analysis
	Pump pit AZ-01A nozzle U6 to 3" line AZ01A/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 14	Jumper manifold from nozzle 15 to nozzle 14		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 14 to 3" line SN-609 to pump pit AW-02A nozzle V	3" transfer line	Yes		N/A		H-14-020802 Sh 2
	Pump pit AW-02A nozzle V to nozzle J	Jumper manifold from nozzle V to nozzle J	Yes		N/A		H-14-020802 Sh 2
	Pump pit AW-02A nozzle J to 3" line SN-267 to valve pit AW-A nozzle L1	3" transfer line	Yes		N/A		H-14-020802 Sh 2
	Valve pit AW-A nozzle L1 to nozzle L15.	Jumper manifold from nozzle L1 to nozzle L15		No		No	H-14-020802 Sh 4
	Valve pit AW-A nozzle L15 to 3" transfer line SN-265 to tank AW-105 pump pit AW-05A nozzle A	3" transfer line	Yes		N/A		H-14-020802 Sh 1
Pump pit AW-05A nozzle A to tank return nozzle D	Jumper manifold from nozzle A to nozzle D	Yes		N/A		H-14-020802 Sh 1	

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Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AY-101 to AP-102 (2004)	AY-101 pump pit AY-01A pump P-101-1 to nozzle U13	Pump and jumper manifold from P-101-1 to nozzle U13		No		No	W-314 alternative analysis
	Pump pit AY-01A nozzle U15 to 3" line SH-635 to pump pit AY-02A nozzle U12	3" transfer line		No	Yes(W-314)		ES-314E-M40
	Pump pit AY-02A nozzle U12 to nozzle U13	Jumper manifold from nozzle U12 to nozzle U13		No		No	W-314 alternative analysis
	Pump pit AY-02A nozzle U13 to 3" line AY02A/AZ02A to pump pit AZ-02A nozzle U22	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AZ-02A nozzle U22 to nozzle U23	Jumper manifold from nozzle U22 to U 23		No	Yes (W314)		ES-314E-M40
	Pump pit AZ-02A nozzle U123 to 3" line SH-630 to valve pit AH-B nozzle R1	3" transfer line		No	Yes (W314)		ES-314E-M40
	Valve pit AH-B nozzle R1 to nozzle R19	Jumper manifold from nozzle R1 to nozzle R19		No	Yes (W314)		ES-314E-M40
	Valve pit AH-B nozzle R19 to 3" line SH-268 to valve pit AH-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L15 to 3" line SH-264 to pump pit AH-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AH-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle D to 3" line AH04A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle E to 3" line SH-624 to pump pit AP-02D nozzle C	3" transfer line		No		No	W-314 alternative analysis

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AV-101 to AP-102 (Continued)	Pump pit AP-02B nozzle C to nozzle A	Pump and jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis W-314 alternative analysis W-314 alternative analysis
	Pump pit AP-02B nozzle A to 3" line SH-622 to pump pit AP-02A nozzle K	3" transfer line		No		No	
	Pump pit AP-02A nozzle K to tank return nozzle E	Jumper manifold from nozzle K to nozzle E		No		No	

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Transfer	Route	Equipment	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AY-101 to AP-104 (2004)	AY-101 pump pit AY-01A to pump pit AY-02A nozzle U13	Jumper manifold from P-101-1 to nozzle U13	No	No	No	No	M-314 alternative analysis
	Pump pit AY-01A nozzle U13 to 3" line SN-635 to pump pit AY-02A nozzle U12	3" transfer line	No	No	Yes (W-314)	No	ES-314E-H40 analysis
	Pump pit AY-02A nozzle U12 to nozzle U13	Jumper manifold from nozzle U12 to nozzle U13	No	No		No	M-314 alternative analysis
	Pump pit AY-02A nozzle U13 to 3" line SN-635 to pump pit AY-02A nozzle U12	3" transfer line	No	No		No	M-314 alternative analysis
	AY-02A/A202A to pump pit A2-02A nozzle U22	Jumper manifold from nozzle U22 to U23	No	No	Yes (K314)	No	ES-314E-H40
	Pump pit A2-02A nozzle U22 to nozzle U23	Jumper manifold from nozzle U22 to U23	No	No	Yes (K314)	No	ES-314E-H40
	Pump pit AZ-02A nozzle U23 to 3" line SN-630 to valve pit AN-B nozzle R1	3" transfer line	No	No	Yes (K314)	No	ES-314E-H40
	Valve pit AN-B nozzle R1 to nozzle R19	Jumper manifold from nozzle R1 to nozzle R19	No	No		No	
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A	Yes	H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A	Yes	H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3" line SN-264 to pump pit AN-104A nozzle A	3" transfer line	Yes		N/A	Yes	H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle B	Jumper manifold from nozzle A to nozzle B	No	No		No	
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D	No	No		No	M-314 alternative analysis
	Pump pit AN-104A nozzle A to nozzle D	3" transfer line	No	No		No	M-314 alternative analysis
	AP-04A/A04A to tank AP-106 pump pit 04D nozzle C	3" transfer line	No	No		No	M-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A	No	No		No	M-314 alternative analysis
	Pump pit AP-04D nozzle A to 3" line SN-623 to A to 3" line SN-623 to pump pit AP-04A nozzle K	3" transfer line	No	No		No	M-314 alternative analysis

EQUIPMENT AVAILABILITY MATRIX

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AP-101 to AP-103 (1999)	AP-101 pump pit AP-101A SH pump-101-1 to nozzle D	Pump and jumper manifold from P-101-1 to nozzle D.	No	No	No	No	W-314 alternative analysis
	Pump pit AP-101A nozzle D to 3" line AP-101A/WP jumper pit WWP nozzle A	3" transfer line	No	No	No	No	W-314 alternative analysis
	Valve pit WWP nozzle A to nozzle E	Jumper manifold from nozzle A to nozzle E	No	No	No	No	W-314 alternative analysis
	Valve pit WWP nozzle E to 3" line WWP/APWP to 241-AP-valve pit nozzle 15	3" transfer line	No	No	No	No	W-314 alternative analysis
	2 1/2" AP-valve pit nozzle 15 to nozzle 17	Jumper manifold from nozzle 15 to nozzle 17	Yes	No	No	No	W-314 alternative analysis
	241-AP-valve pit nozzle 17 to 3" line SH-613 to tank AP-103 pump pit AP-03A nozzle A	3" transfer line	Yes	No	N/A	N/A	W-314 alternative analysis H-14-020803 SH 1
	Pump pit AP-03A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes	No	N/A	N/A	H-14-020803 SH 1

References	Equipment Planned		Equipment Installed		Equipment Needs	Equipment	Transfer Route	AN-105 to Ap-102 (2001)
	Yes (Project #)	No	Yes (ID or label)	No				
H-14-020801 SH 1	No	No	No	No	AN-105 pump pit AN-105A SH pump P-105 to nozzle A	Jump manifold from pump P-105 to nozzle A	AN-105 pump pit AN-105A SH pump P-105 to nozzle A	
H-14-020801 SH 1	N/A	N/A	N/A	N/A	Jump manifold from nozzle L16 to nozzle L15	Jump manifold from nozzle L16 to nozzle L15	Pump pit AN-105A nozzle A to nozzle 3" line SH-265 to valve pit AH-A nozzle L16	
H-14-020801 SH 5	N/A	N/A	N/A	N/A	3" transfer line	3" transfer line	Valve pit AH-A nozzle L15 to 3" line SH-264 to pump pit AH-104A nozzle A	
H-14-020801 SH 5	No	No	No	No	3" transfer line	3" transfer line	Pump pit AH-104A nozzle A to nozzle D	
M-314 alternative analysis	No	No	No	No	3" transfer line	3" transfer line	Pump pit AH-104A nozzle D to 3" line AH104A/AP04D to tank nozzle C	
H-14-102097 SH 1	Yes (W-211)	No	No	No	Jump manifold from nozzle c to nozzle E	Jump manifold from nozzle c to nozzle E	Pump pit AP-04D nozzle C to nozzle E	
H-14-102097 SH 1	Yes (W-211)	No	No	No	3" transfer line	3" transfer line	Pump pit AP-04D nozzle E to 3" line SH-624 to pump pit AP-02D nozzle C	
H-14-102097 SH 1	Yes (W-211)	No	No	No	Jump manifold from nozzle c to nozzle A	Jump manifold from nozzle c to nozzle A	Pump pit AP-02D nozzle C to nozzle A	
H-14-102097 SH 1	Yes	Yes	Yes	Yes	3" transfer line	3" transfer line	Pump pit AP-02D nozzle A to 3" line SH-622 to pump pit AP-02A nozzle K	
H-14-102096 SH 1	Yes (W-211)	No	No	No	Jump manifold from nozzle k to nozzle E	Jump manifold from nozzle k to nozzle E	Pump pit AP-02A nozzle K to tank return nozzle E	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-105 to AP-104 (2001)	AN-105 pump pit AN-105A SH pump P-105 to nozzle A	Pump and jumper manifold from P-105 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-105A nozzle A to nozzle 3" line SH-265 to valve pit AN-A nozzle L16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L16 to nozzle L15	Jumper manifold from nozzle L16 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3" line SH-264 to pump pit AN-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN104A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-04D nozzle A to 3" line SH-623 to pump pit AP-04A nozzle K	3" transfer line		No	Yes (W-211)		H-14-102097 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-104 to AP-102 (2001)	AN-104 pump pit AN-104A SN pump P-104 to nozzle D	Pump and jumper manifold from P-104 to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN104A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line.		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-04D nozzle E to 3" line SN-624 to pump pit AP-02D nozzle C	3" transfer line		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-02D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-02D nozzle A to 3" line SN-622 to pump pit AP-02A nozzle K	3" transfer line	Yes		N/A		H-14-102097 SH 1
	Pump pit AP-02A nozzle K to tank return nozzle E	Jumper manifold from nozzle K to nozzle E		No		No	H-14-102096 SH 1
AN-104 to AP-104 (2001)	AN-104 pump pit AN-104A SN pump P-104 to nozzle D	Pump and jumper manifold from P-104 to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN104A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer Line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-04D nozzle A to 3" line SN-623 to pump pit AP-04A nozzle K	3" transfer line		No	Yes (W-211)		H-14-102097 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AH-103 to AP-102 (2603)	AH-103 pump pit AH-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AH-103A nozzle A to 3" line SH-263 to valve pit AH-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AH-B nozzle R14 to nozzle R19	Jumper manifold from nozzle R14 to nozzle R19		No		No	H-14-020801 SH 6
	Valve pit AH-B nozzle R19 to 3" line SH-268 to valve pit AH-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L15 to 3" line SH-264 to pump pit AH-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AH-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle D to 3" line AH104A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No	Yes (W-211)		H-14-1-2097 SH 1
	Pump pit AP-04D nozzle E to 3" line SH-624 to pump pit AP-02D nozzle C	3" transfer line		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-02D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-02D nozzle A to 3" line SH-622 to pump pit AP-02A nozzle K	3" transfer line	Yes		N/A		H-14-102097 SH 1
	Pump pit AP-02A nozzle K to tank return nozzle E	Jumper manifold from nozzle K to nozzle E		No	Yes (W-211)		H-14-102096 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AH-103 to AP-104 (2003)	AH-103 pump pit AH-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AH-103A nozzle A to 3" line SN-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R19	Jumper manifold from nozzle R14 to nozzle R19		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3" line SN-264 to pump pit AN-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN104A/AP040 to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No	Yes (W-211)		H-14-1-2097 SH 1
	Pump pit AP-04D nozzle A to 3" line SN-623 to pump pit AP-04A nozzle K	3" transfer line		No	Yes (W-211)		H-14-102097 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-105 (2005)	AN-103 pump pit AN-103A SN pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SN-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SN-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN101A/HVP to valve pit HVP nozzle A	3" transfer line		No		No	W-314 alternative analysis
	Valve pit HVP nozzle A to nozzle E	Jumper manifold from nozzle A to nozzle E		No		No	W-314 alternative analysis
	Valve pit HVP nozzle E to 3" line HVP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 24	Jumper manifold from nozzle 15 to nozzle 24		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 24 to 3" line SN-615 to tank AP-105 pump pit AP-05A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 2
Pump pit AP-05A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 2	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-103 (2005)	AN-103 pump pit AN-103A SN pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SM-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SM-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN101A/NVP to yavive pit NVP nozzle A	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle A to nozzle E	Jumper manifold from nozzle A to nozzle E		No		No	W-314 alternative analysis
	Valve pit NVP nozzle E to 3" line NVP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 17	Jumper manifold from nozzle 15 to nozzle 17		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 17 to 3" line SM-613 to tank AP-103 pump pit AP-03A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 1
Pump pit AP-03A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 1	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-101 (2005)	AN-103 pump pit AN-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SH-263 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SH-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN101A/HVP to valve pit NVP nozzle A	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle A to nozzle E	Jumper manifold from nozzle A to nozzle E		No		No	W-314 alternative analysis
	Valve pit NVP nozzle E to 3" line NVP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 18	Jumper manifold from nozzle 15 to nozzle 18		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 18 to 3" line SH-611 to tank AP-101 pump pit AP-01A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 1
Pump pit AP-01A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 1	

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Transfer Route	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AH-107 to AP-102 (2005)	AH-107 pump pit AH-107A	Pump and Jumper manifold from P-019 to nozzle A	No	No	No	No	H-14-020801 SH 1
	3" transfer line	Yes		N/A			H-14-020801 SH 1
	Valve pit AH-A nozzle L1 to nozzle L15	Yes		N/A			H-14-020801 SH 5
	Valve pit AH-A nozzle L15 to 3" line SH-264 to pump pit AH-106A nozzle A	Yes		N/A			H-14-020801 SH 5
	Pump pit AH-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D	No			No	M-314 alternative analysis
	Pump pit AH-104A nozzle D to 3" line SH-264 to tank AP-104 pump pit 040 nozzle C	3" transfer line	No			No	M-314 alternative analysis
	Pump pit AP-040 nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E	No		Yes (H-211)		H-14-102097 SH 1
	Pump pit AP-040 nozzle E to 3" line SH-624 to pump pit AP-02D nozzle C	3" transfer line	No		Yes (H-211)		H-14-102097 SH 1
	Pump pit AP-02D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A	No		Yes (H-211)		H-14-102097 SH 1
	Pump pit AP-02D nozzle A to nozzle K	3" transfer line	Yes		N/A		H-14-102097 SH 1
	Pump pit AP-02A nozzle E to tank return nozzle E	Jumper manifold from nozzle E to nozzle E	No		Yes (H-211)		H-14-102096 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-107 to AP-104 (2005)	AN-107 pump pit AN-107A SN pump P-019 to nozzle A	Pump and jumper manifold from P-019 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-107A nozzle A to nozzle 3 rd line SN-267 to valve pit AN-A nozzle L1	3 rd transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L1 to nozzle L15	Jumper manifold from nozzle L1 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3 rd line SN-264 to pump pit AN-104A nozzle A	3 rd transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3 rd line AN104A/AP040 to tank AP-104 pump pit 040 nozzle C	3 rd transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-04D nozzle A to 3 rd line SN-623 to pump pit AP-04A nozzle K	3 rd transfer line		No	Yes (W-211)		H-14-102097 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-102 to AP-102 (2005)	AN-102 pump pit AN-102A SN pump P-102-1 to nozzle A	Pump and jumper manifold from P-102-1 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-102A nozzle A to 3" line SN-262 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R16 to nozzle R19	Jumper manifold from nozzle R16 to nozzle R19		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L15 to 3" line SN-264 to pump pit AN-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AN-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-104A nozzle D to 3" line AN104A/AP04D to tank AP-104 pump pit 04D nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle A		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-04D nozzle E to 3" line SN-624 to pump pit AP-02D nozzle C	3" transfer line		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-02D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-02D nozzle A to 3" line SN-622 to pump pit AP-02A nozzle K	3" transfer line	Yes		N/A		H-14-102097 SH 1
	Pump pit AP-02A nozzle K to tank return nozzle E	Jumper manifold from nozzle K to nozzle E		No	Yes (W-211)		H-14-102096 SH 1

Transfer	Transfer Route	Equipment Access	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AH-102 to AP-104 (2005)	AH-102 pump pit AH-102A SH Pump P-102-1 to nozzle A	Pump and Jumper manifold from P-102-1 to nozzle A	No	No	No	No	H-14-020801 SH 1
	Pump pit AH-102A nozzle A to 3" line SH-262 to valve pit AH-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AH-B nozzle R16 to nozzle R19	Jumper manifold from nozzle R16 to nozzle R19		No		No	H-14-020801 SH 6
	Valve pit AH-B nozzle R19 to 3" line SH-268 to valve pit AH-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15	Yes		N/A		H-14-020801 SH 5
	Valve pit AH-A nozzle L15 to 3" line SH-264 to valve pit AH-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Pump pit AH-104A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle D to 3" line AH104A/AP040 to tank AP-104 pump pit 040 nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AP-040 nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		Yes (W-211)	H-14-102097 SH 1
	Pump pit AP-040 nozzle A to 3" line SH-623 to pump pit AP-040A nozzle A	3" transfer line		No		Yes (W-211)	H-14-102097 SH 1

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References	Equipment Planned		Equipment Installed		Yes (ID or label)	Equipment Needs	Transfer Route	AR-106 to AP-102 (2005)
	No	Yes (Project #)	No	Yes (Project #)				
H-14-020801 SH 1	No		No		No	Pump pit AH-106A nozzle SH pump P-016 to nozzle A	Pump pit AH-106A nozzle SH pump P-016 to nozzle A	
H-14-020801 SH 1	No		No		No	3" transfer line	3" transfer line	
H-14-020801 SH 5	No		No		No	Valve pit AH-A nozzle L14 to nozzle L15	Valve pit AH-A nozzle L14 to nozzle L15	
H-14-020801 SH 5	No		No		No	3" transfer line	3" transfer line	
H-14-020801 SH 5	No		No		No	Jumpers manifold from nozzle L14 to nozzle L15	Jumpers manifold from nozzle L14 to nozzle L15	
M-316 alternative analysis	No		No		No	3" transfer line	3" transfer line	
M-316 alternative analysis	No		No		No	Jumpers manifold from nozzle A to nozzle D	Jumpers manifold from nozzle A to nozzle D	
H-14-102097 SH 1	No		No		No	3" transfer line	3" transfer line	
H-14-102097 SH 1	No		No		No	3" transfer line	3" transfer line	
H-14-102097 SH 1	No		No		No	3" transfer line	3" transfer line	
H-14-102097 SH 1	No		No		No	3" transfer line	3" transfer line	
H-14-102096 SH 1	No		No		No	3" transfer line	3" transfer line	
	No		No		No	Jumpers manifold from nozzle K to nozzle E	Jumpers manifold from nozzle K to nozzle E	
	No		No		No	AP-106 pump pit AH-106A nozzle K to nozzle E	AP-106 pump pit AH-106A nozzle K to nozzle E	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AH-106 to AP-104 (2006)	AH-106 pump pit AH-106A SH pump P-016 to nozzle A	Pump and jumper manifold from P-016 to nozzle A	No	No	No	No	H-14-020801 SH 1
	Pump pit AH-106A nozzle nozzle A to pump pit SH-264 nozzle A to pump pit SH-A nozzle L14	3" transfer line	Yes	No	N/A	No	H-14-020801 SH 1
	Valve pit AH-A nozzle L14 to nozzle L15	Jumper manifold from nozzle L14 to nozzle L15	Yes	No	N/A	No	H-14-020801 SH 5
	Valve pit AH-A nozzle L15 to 3" line SH-264 to pump pit AH-106A nozzle A	3" transfer line	Yes	No	N/A	No	H-14-020801 SH 5
	Pump pit AH-106A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D	No	No	No	No	W-314 alternative analysis
	Pump pit AH-106A nozzle A to nozzle D to tank AH104/AP100 to tank AP-104 pump pit 04D nozzle C	3" transfer line	No	No	No	No	W-314 alternative analysis
	Pump pit AP-04D nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A	No	No	Yes (N-211)	No	H-14-102097 SH 1
	Pump pit AP-04D nozzle A to 3" line SH-023 to pump pit AP-04A nozzle K	3" transfer line	No	No	Yes (N-211)	No	H-14-102097 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-103 to AP-107 (2008)	AN-103 pump pit AN-103A SM pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SM-253 to valve pit AN-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SM-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN101A/NVP to valve pit NVP nozzle A	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle A to nozzle E	Jumper manifold from nozzle A to nozzle E		No		No	W-314 alternative analysis
	Valve pit NVP nozzle E to 3" line NVP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 23	Jumper manifold from nozzle 15 to nozzle 23		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 23 to 3" line SM-617 to tank AP-107 pump pit AP-07A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 2
Pump pit AP-07A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 2	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AH-103 to AP-108 (2011)	AH-103 pump pit AN-103A SH pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-103A nozzle A to 3" line SN-263 to valve pit AH-B nozzle R14	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R14 to nozzle R15	Jumper manifold from nozzle R14 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AH-B nozzle R15 to 3" line SN-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle DJ		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN101A/NVP to valve pit NVP nozzle A	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle A to nozzle E	Jumper manifold from nozzle A to nozzle E		No		No	W-314 alternative analysis
	Valve pit NVP nozzle E to 3" line NVP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 22	Jumper manifold from nozzle 15 to nozzle 22		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 22 to 3" line SN-618 to tank AP-108 pump pit AP-08A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 4
Pump pit AP-08A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 4	

Transfer	Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AN-102 to AP-108 (2011)	Transfer	AN-102 pump pit AN-102A to SN pump P-102-1 to nozzle A	No	No	No	No	H-14-020801 SH 1
		Pump pit AN-102A nozzle A to 3" line SN-262 to valve pit AH-B nozzle R16	No	No	No	No	H-14-020801 SH 1
		Valve pit AH-B nozzle R16 to nozzle R15	No	No	No	No	H-14-020801 SH 6
		Valve pit AH-B nozzle R15 to nozzle R16 to nozzle R15	No	No	No	No	H-14-020801 SH 6
		Valve pit AN-101A nozzle A to pump pit AN-101A	No	No	No	No	H-14-020801 SH 6
		Pump pit AN-101A nozzle A to nozzle D	No	No	No	No	H-14-020801 SH 6
		Pump pit AN-101A nozzle D to 3" line AN101A/NFP to valve pit NFP	No	No	No	No	H-14-020801 SH 6
		Valve pit NFP nozzle A to nozzle E	No	No	No	No	H-14-020801 SH 6
		Valve pit NFP nozzle A to nozzle E	No	No	No	No	H-14-020801 SH 6
		Valve pit NFP nozzle E to 3" line NFP/APP to 241-AP-valve pit nozzle 15	No	No	No	No	H-14-020803 SH 4
		241-AP-valve pit nozzle 15 to nozzle 22	No	No	No	No	H-14-020803 SH 4
		Valve pit NFP nozzle E to 3" line SN-618 to 241-AP-valve pit nozzle 22	No	No	No	No	H-14-020803 SH 4
		241-AP-valve pit nozzle 22 to 3" line SN-618 to AP-08A nozzle A	No	No	No	No	H-14-020803 SH 4
		AP-08A nozzle A to tank return nozzle A to tank return nozzle E	No	No	No	No	H-14-020803 SH 4
		Valve pit NFP nozzle E to 3" line SN-618 to 241-AP-valve pit nozzle 22	No	No	No	No	H-14-020803 SH 4
		241-AP-valve pit nozzle 22 to 3" line SN-618 to AP-08A nozzle A	No	No	No	No	H-14-020803 SH 4
		AP-08A nozzle A to tank return nozzle A to tank return nozzle E	No	No	No	No	H-14-020803 SH 4

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AN-102 to AP-106 (2011)	AN-102 pump pit AN-102A SH pump P-102-1 to nozzle A	Pump and jumper manifold from P-102-1 to nozzle A		No		No	H-14-020801 SH 1
	Pump pit AN-102A nozzle A to 3" line SH-262 to valve pit AN-B nozzle R16	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R16 to nozzle R15	Jumper manifold from nozzle R16 to nozzle R15		No		No	H-14-020801 SH 6
	Valve pit AN-B nozzle R15 to 3" line SH-261 to pump pit AN-101A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 6
	Pump pit AN-101A nozzle A to nozzle D	Jumper manifold from nozzle A to nozzle D1		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to 3" line AN101A/NVP to valve pit NVP nozzle A	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle A to nozzle E	Jumper manifold from nozzle A to nozzle E		No		No	W-314 alternative analysis
	Valve pit NVP nozzle E to 3" line NVP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 21	Jumper manifold from nozzle 15 to nozzle 21		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 21 to 3" line SH-616 to tank AP-105 pump pit AP-06A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 4
Pump pit AP-06A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E	Yes		N/A		H-14-020803 SH 4	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AP-108 to AN-105 (2001)	AP-108 pump pit AP-08A SH pump P-008 to nozzle A	Pump and jumper manifold from P-008 to nozzle A	Yes			N/A	H-14-020803 SH 4
	Pump pit AP-08A nozzle A to 3" line SN-618 to 241-AP-valve pit nozzle 22	3" transfer line	Yes			N/A	H-14-020803 SH 4
	241-AP-valve pit nozzle 22 to nozzle 15	Jumper manifold from nozzle 22 to nozzle 15		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to 3" line NVP/APVP to NVP nozzle E	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle E to nozzle A	Jumper manifold from nozzle E to nozzle A		No		No	W-314 alternative analysis
	Valve pit NVP nozzle A to 3" line AN101A/NVP to pump pit AN-101A nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle A to 3" line SN-261 to valve pit AN-B nozzle R15	3" transfer line	Yes			N/A	H-14-020801 SH 1
	Valve pit AN-B nozzle R15 to nozzle R19	Jumper manifold from nozzle R15 to nozzle R19		No		Yes(W-314)	ES-314E-M40
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes			N/A	H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L16	Jumper manifold from nozzle L19 to nozzle L16		No		Yes(W-314)	ES-314E-M40
Valve pit AN-A nozzle L16 to 3" line SN-265 to tank AN-105 pump pit AN-105A nozzle A	3" transfer line	Yes			N/A	H-14-020801 SH 1	
Pump pit AN-105A nozzle A to tank return nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	H-14-020801 SH 1	

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Transfer Route	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AP-102 to AH-105 (2004)	AP-102 pump pit AP-020 SW pump P-002 to nozzle C	Pump and jumper manifold from P-002 to nozzle C	No	No	Yes (H-211)	No	H-14-102097 SH 1
	Pump pit AP-020 nozzle C to 3" line SH-024 to pump pit 040 nozzle E	3" transfer line	No	No	Yes (H-211)		H-14-102097 SH 1
	Pump pit 040 nozzle E to nozzle C	Jumper manifold from nozzle E to nozzle C	No	No	Yes (H-211)		H-14-102097 SH 1
	Pump pit AP-040 nozzle C to 3" line AH-104/PP040 to pump pit AH-104A nozzle D	3" transfer line	No	No		No	H-214 alternative analysis
	Pump pit AH-104A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A	No	No		No	H-214 alternative analysis
	Pump pit AH-104A nozzle A to 3" line SH-264 to AH-A valve pit nozzle L15	3" transfer line	Yes	No	B/A	No	H-14-020801 SH 1
	Valve pit AH-A nozzle L15 to nozzle L16	Jumper manifold from nozzle L15 to nozzle L16	No	No	Yes (H-214)	No	ES-514E-M40
	Valve pit AH-A nozzle L16 to 3" line SH-265 to tank AH-105 pump pit AH-105A nozzle A	3" transfer line	Yes	No	N/A	No	H-14-020801 SH 1
	Pump pit AH-105A nozzle D to tank return nozzle D	Jumper or nozzle from nozzle A to nozzle D	No	No		No	H-14-020801 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AP-107 to AN-104 (2002)	AP-107 pump pit AP-07A SN pump P-007 to nozzle A	Pump and jumper manifold from P-007 to nozzle A	Yes		N/A		H-14-020803 SH 4
	Pump pit AP-07A nozzle A to 3" line SN-617 to 241-AP-valve pit nozzle Z3	3" transfer line	Yes		N/A		H-14-020803 SH 4
	241-AP-valve pit nozzle Z3 to nozzle 15	Jumper manifold from nozzle Z3 to nozzle 15		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to 3" line NVP/APVP to NVP nozzle E	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle E to nozzle A	Jumper manifold from nozzle E to nozzle A		No		No	W-314 alternative analysis
	Valve pit NVP nozzle A to 3" line AN101A/HVP to pump pit AN-101A nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle A to 3" line SN-261 to valve pit AN-B nozzle R15	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R15 to nozzle R19	Jumper manifold from nozzle R15 to nozzle R19		No	Yes(W-314)		ES-314E-M40
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15		No	Yes(W-314)		ES-314E-M40
	Valve pit AN-A nozzle L15 to 3" line SN-264 to tank AN-104 pump pit AN-104A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 1
Pump pit AN-104A nozzle A to tank return nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	H-14-020801 SH 1	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AP-104 to AN-105 (2004).	AP-104 pump pit 04D HT pump P-002 to nozzle C	Pump and jumper manifold from P-002 to nozzle C		No	Yes (W-211)		H-14-102097 SH 1
	Pump pit AP-04D nozzle C to 3" line AH104A/APD4D to pump pit AH-104A nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A		No		No	W-314 alternative analysis
	Pump pit AH-104A nozzle A to 3" line SN-264 to AN-A valve pit nozzle L15	3" transfer line	Yes		B/A		H-14-020801 SH 1
	Valve pit AN-A nozzle L15 to nozzle L16	Jumper manifold from nozzle L15 to nozzle L16		No	Yes(W-314)		ES-314E-M40
	Valve pit AN-A nozzle L16 to 3" line SN-265 to tankd AN-105 pump pit. AN-105A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Pump pit AN-105A nozzle A to tank return nozzle D	Jumper or nozzle from nozzle A to nozzle D		No		No	H-14-020801 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AZ-102 to AN-104 (2002)	AZ-102 pump pit 02A SN pump P-102-1 to nozzle U18	Pump and jumper manifold from P-102-1 to nozzle U18		No		No	W-314 alternative analysis
	Pump pit AZ-02A nozzle U18 to 3" line SN-631 to pump pit AZ-01A nozzle U10	3" transfer line		No	Yes(W-314)		ES-314E-M40
	Pump pit AZ-01A nozzle U10 to U6	Jumper manifold from nozzle U10 to nozzle U6		No		No	W-314 alternative analysis
	Pump pit AZ-01A nozzle U6 to 3" line AZ01A/NVP to valve pit NVP nozzle B	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle B to nozzle A	Jumper manifold from nozzle B to nozzle A		No		No	W-314 alternative analysis
	Valve pit NVP nozzle A to 3" line AN101A/NVP to pump pit AN-101A nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A	Yes	No	N/A	No	W-314 alternative analysis H-14-020801 SH 1
	Pump pit AN-101A nozzle A to 3" line SN-261 to valve pit AN-B nozzle R15	3" transfer line		No		No	W-314 alternative analysis
	Valve pit AN-B nozzle R15 to nozzle R19	Jumper manifold from nozzle R15 to nozzle R19		No	Yes(W-314)		ES-314E-M40
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes	No	N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L15	Jumper manifold from nozzle L19 to nozzle L15		No	Yes(W-314)		ES-314E-M40
	Valve pit AN-A nozzle L15 to 3" line SN-264 to tank AN-104 pump pit AN-104A nozzle A	3" transfer line	Yes	No	N/A		H-14-020801 SH 1
	Pump pit An-104A nozzle A to tank return nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	H-14-020801 SH 1

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Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AZ-102 to AH-105 (2002)	AZ-102 pump pit 02A, SN from P-102-1 to nozzle U18	Pump and Jumper manifold from P-102-1 to nozzle U18		No	No	No	W-314 alternative analysis
	Pump pit AZ-02A nozzle U18 to 3" line SN-631 to pump pit AZ-01A nozzle U10	3" transfer line		No	Yes(H-314)		ES-314E-M40
	Pump pit AZ-01A nozzle U10 to U6	Jumper manifold from nozzle U10 to nozzle U6		No	No	No	W-314 alternative analysis
	Pump pit AZ-01A nozzle U6 to 3" line AZ01A/WP to valve pit WP nozzle B	3" transfer line		No	No	No	W-314 alternative analysis
	Valve pit WP nozzle B to nozzle A	Jumper manifold from nozzle B to nozzle A		No	No	No	W-314 alternative analysis
	Valve pit WP nozzle A to 3" line AH101A/WP to pump pit AH-101A nozzle D	3" transfer line		No	No	No	W-314 alternative analysis
	Pump pit AH-101A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A	Yes	No	No	No	W-314 alternative analysis
	Pump pit AH-101A nozzle A to 3" line SN-261 to valve pit AH-B nozzle R15	3" transfer line		No	N/A	No	H-14-020801 SH 1
	Valve pit AH-B nozzle R15 to nozzle R19	Jumper manifold from nozzle R15 to nozzle R19	Yes	No	Yes(H-314)	No	ES-314E-M40
	Valve pit AH-A nozzle R19 to valve pit AH-A nozzle L19	3" transfer line		No	N/A	No	H-14-020801 SH 5
Valve pit AH-A nozzle L19 to nozzle L16	Jumper manifold from nozzle L19 to nozzle L16	Yes	No	Yes(H-314)	No	ES-314E-M40	
Valve pit AH-A nozzle L16 to 3" line SN-265 to tank AH-105 pump pit AH-105A nozzle A	3" transfer line		No	N/A	No	H-14-020801 SH 1	
Pump pit AH-105A nozzle A to tank return nozzle D	Jumper manifold from nozzle A to nozzle D		No	No	No	H-14-020801 SH 1	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AY-102 to AN-105 (2005)	AY-102 pump pit AY-02A SH pump P-102-1 to nozzle U13	Pump and jumper manifold from P-102-1 to nozzle U13		No		No	W-314 alternative analysis
	Pump pit AY-02A nozzle U13 to 3" line AY02A/HVP to valve pit HVP, nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Valve pit HVP nozzle C to nozzle A	Jumper manifold from nozzle C to nozzle A		No		No	W-314 alternative analysis
	Valve pit HVP nozzle A to 3" line AN101A/HVP to pump pit AN-101A nozzle D	3" transfer line		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle D to nozzle A	Jumper manifold from nozzle D to nozzle A		No		No	W-314 alternative analysis
	Pump pit AN-101A nozzle A to 3" line SN-261 to valve pit AN-B nozzle R15	3" transfer line	Yes		N/A		H-14-020801 SH 1
	Valve pit AN-B nozzle R15 to nozzle R19	Jumper manifold from nozzle R15 to nozzle R19		No	Yes(W-314)		ES-314E-W40
	Valve pit AN-B nozzle R19 to 3" line SN-268 to valve pit AN-A nozzle L19	3" transfer line	Yes		N/A		H-14-020801 SH 5
	Valve pit AN-A nozzle L19 to nozzle L16	Jumper manifold from nozzle L19 to nozzle L16		No	Yes(W-314)		ES-314E-W40
	Valve pit AN-A nozzle L16 to 3" line SN-265 to tank AN-105 pump pit AN-105A nozzle A	3" transfer line	Yes		N/A		H-14-020801 SH 1
Pump pit An-105A nozzle A to tank return nozzle D	Jumper manifold from nozzle A to nozzle D		No		No	H-14-020801 SH 1	

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AZ-101 to AY-101 (2000)	AZ-101 pump pit AZ-01A pump P-101-1 to nozzle U6	Pump and jumper manifold from P-101-1 to nozzle U6		No		No	W-314 alternative analyziz
	Pump pit AZ-01A nozzle U6 to 3" line AZ01A/NVP to valve pit NVP nozzle B	3" transfer line		No		No	W-314 alternative analyziz
	Valve pit NVP nozzle B to nozzle C	Jumper from nozzle B to nozzle C		No		No	W-314 alternative analyziz
	Valve pit NVP nozzle C to 3" line AY02ANVP to pump pit AY-02A nozzle U13	3" transfer line		No		No	W-314 alternative analyziz
	Pump pit AY-02A nozzle U13 to nozzle U12	Jumper manifold from nozzle U13 to nozzle U12		No		No	W-314 alternative analyziz
	Pump pit AY-02A nozzle U12 to 3" line SN-635 to pump pit AY-01A nozzle U13	3" transfer line		No	Yes(W-314)		ES-314E-M40
	Pump pit AY-01A nozzle U12 to tank return nozzle	Jumper manifold from nozzle U12 to tank return nozzle		No		No	ES-314E-M40

Transfer Route	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AZ-102 to AY-101 (2002)	AZ-102 pump pit AZ-02A pump P-102-1 to nozzle U18	Pump and jumper manifold from P-102-1 to nozzle U18	No	No	No	No	W-314 alternative analysis ES-314E-W40
	Pump pit AZ-01A nozzle U10 to nozzle U18 to 3" line A2-01A to pump pit AZ-01A nozzle U10	3" transfer line	No	No	Yes(W-314)	No	W-314 alternative analysis W-314 alternative analysis
	Pump pit AZ-01A nozzle U10 to nozzle U6 Pump pit AZ-01A nozzle U6 to 3" line A2-01A/NVP to valve pit WVP nozzle B	Jumper manifold from nozzle U10 to nozzle U6 3" transfer line	No	No	No	No	W-314 alternative analysis W-314 alternative analysis
	Valve pit WVP nozzle B to nozzle C Valve pit WVP nozzle C to 3" line A102/NVP to pump pit AY-02A nozzle U13	Jumper from nozzle B to nozzle C 3" transfer line	No	No	No	No	W-314 alternative analysis W-314 alternative analysis
	Pump pit AY-02A nozzle U13 to nozzle U12 Pump pit AY-02A nozzle U12 to 3" line SH-635 to pump pit AY-01A nozzle U13	Jumper manifold from nozzle U13 to nozzle U12 3" transfer line	No	No	Yes(W-314)	No	W-314 alternative analysis ES-314E-W40
	Pump pit AY-01A nozzle U12 to tank return nozzle	Jumper manifold from nozzle U12 to tank return nozzle	No	No	No	No	ES-314E-W40

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Transfer	Transfer Source	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AZ-101 to AH-105 (2000)	AZ-101 pump pit A2-01A pump P-101-1 to nozzle U6	Pump and Jumper manifold from P-10101 to nozzle U6		No		No	U-314 alternative analyziz
	Pump pit A2-01A nozzle U6 to 3" line A201A/NWP to valve pit NWP nozzle B	3" transfer line		No		No	U-314 alternative analyziz
	Valve pit NWP nozzle B to nozzle E	Jumper manifold from nozzle B to nozzle E		No		No	U-314 alternative analyziz
	Valve pit NWP nozzle E to 3" line NWP/APWP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	U-314 alternative analyziz
	241-AP-valve pit nozzle 15 to nozzle 14	Jumper manifold from nozzle 15 to nozzle 14		No		No	U-314 alternative analyziz
	241-AP-valve pit nozzle 14 to 3" line NWP/APWP to pump pit AH-02A nozzle V	3" transfer line	Yes		N/A		I-14-020802 SH 2
	Pump pit AH-02A nozzle V to nozzle J	Jumper manifold from nozzle V to nozzle J	Yes		N/A		I-14-020802 SH 2
	Pump pit AH-02A nozzle J to 3" line SH-267 to valve pit AH-A nozzle L1	3" transfer line	Yes		N/A		I-14-020802 SH 2
	Valve pit AH-A nozzle L1 to nozzle L1B	Jumper manifold from nozzle L1 to nozzle L1B		No		No	I-14-020802 SH 4
	Valve pit AH-A nozzle L1B to 3" transfer line SH-265 to tank AH-105	3" transfer line	Yes		N/A		I-14-020802 SH 1
	Pump pit AH-02A nozzle A	Jumper manifold from nozzle A to tank return nozzle D	Yes		N/A		I-14-020802 SH 1

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or Label)	No	Yes (Project #)	No	
AY-101 to AP-102 (2004)	AY-101 pump pit AY-01A pump P-101-1 to nozzle U13	Pump and jumper manifold from P-101-1 to nozzle U13		No		No	W-314 alternative analysis
	Pump pit AY-01A nozzle U13 to 3" line SH-635 to pump pit AY-02A nozzle U12	3" transfer line		No	Yes(W-314)		ES-314E-M40
	Pump pit AY-02A nozzle U12 to nozzle U13	Jumper manifold from nozzle U12 to nozzle U13		No		No	W-314 alternative analysis
	Pump pit AY-02A nozzle U13 to 3" line AY02A/NVP nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Valve pit NVP nozzle E to 3" line NVP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 19	Jumper manifold from nozzle 15 to nozzle 19	Yes			No	W-314 alternative analysis
	241-AP-valve pit nozzle 19 to 3" line SH-612 to tank AP-102 pump pit AP-02A nozzle A	3" transfer line		Yes		N/A	H-14-020803 SH 3
	Pump pit AP-02A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E		Yes		N/A	H-14-020803 SH 3

Transfer	Transfer Route	Equipment Needs	Equipment Installed		Equipment Planned		References
			Yes (ID or label)	No	Yes (Project #)	No	
AY-101 to AP-104 (2004)	AY-101 pump pit AY-01A pump P-101-1 to nozzle U13	Pump and jumper manifold from P-101-1 to nozzle U13		No		No	W-314 alternative analysis
	Pump pit AY-01A nozzle U13 to 3" line SH-635 to pump pit AY-02A nozzle U12	3" transfer line		No	Yes(W-314)		ES-314E-M40
	Pump pit AY-02A nozzle U12 to nozzle U13	Jumper manifold from nozzle U12 to nozzle U13		No		No	W-314 alternative analysis
	Pump pit AY-02A nozzle U13 to 3" line AY02A/NVP nozzle C	3" transfer line		No		No	W-314 alternative analysis
	Valve pit NVP nozzle C to nozzle E	Jumper manifold from nozzle C to nozzle E		No		No	W-314 alternative analysis
	Valve pit NVP nozzle E to 3" line NVP/APVP to 241-AP-valve pit nozzle 15	3" transfer line		No		No	W-314 alternative analysis
	241-AP-valve pit nozzle 15 to nozzle 20	Jumper manifold from nozzle 15 to nozzle 20	Yes		N/A		W-314 alternative analysis H-14-020803 SH 3
	241-AP-valve pit nozzle 20 to 3" line SH-614 to tank AP-104 pump pit AP-04A nozzle A	3" transfer line	Yes		N/A		H-14-020803 SH 3
Pump pit AP-04A nozzle A to tank return nozzle E	Jumper manifold from nozzle A to nozzle E						

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APPENDIX G
COST ESTIMATES

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FLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. 2569 (ALT-7B)
 FILE NO. 25691L7B

** TEST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE XPER (AN-AZ-AY TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-7B)
 PHMCR01 - PROJECT COST SUMMARY

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 DATE 03/31/98 14:16:56
 BY JFM/KLR/SWF/DKH

SORT	DESCRIPTION	ESCALATED	CONTINGENCY		TOTAL
		TOTAL COST	%	TOTAL	DOLLARS
FDH	FLUOR DANIEL HANFORD, INC.	740,000	15	110,000	850,000
FDNM	FLUOR DANIEL NORTHWEST	19,870,000	17	3,350,000	23,220,000
LMHC	LOCKHEED MARTIN HANFORD CORP.	6,820,000	10	680,000	7,500,000
SUBTOTAL		27,430,000	15	4,140,000	31,570,000
SITE	SITE ALLOCATIONS	5,130,000	15	760,000	5,890,000
	(ADJUSTED TO MEET DOE 5100.4)	40,000		0	40,000
PROJECT TOTAL		32,600,000	15	4,900,000	37,500,000

DRAFT

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TYPE OF ESTIMATE	ROUGH ORDER OF MAGNITUDE	REMARKS:
FDNM LEAD ESTIMATOR	J. MOKLER	ESTIMATING MANAGER
PROJECT MANAGER	J. CUNNINGHAM	CHADWICK
CLIENT	NUMATEC	ALT # 7B

(ROUNDED/ADJUSTED TO THE NEAREST * 10,000 / 100,000 * - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

FLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. Z569 (ALT-7B)
 FILE NO. Z56917LD

** EST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE KPER (AN-AZ-AY TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-7B)
 PHMCR02 - WORK BREAKDOWN STRUCTURE (NBS) SUMMARY

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 DATE 03/31/98 14:17:05
 BY JPM/KLR/SMP/DKH

NBS	DESCRIPTION	ESTIMATE SUBTOTAL	ESCALATION %	TOTAL	SUB TOTAL	CONTINGENCY %	TOTAL	SUB TOTAL	SITE ALLOCAT'N	TOTAL DOLLARS
111000	DEFINITIVE DESIGN	2825928	0.00	0	2825928	10	282592	3108520	836502	3945023
	SUBTOTAL 11 ENGINEERING	2825928	0.00	0	2825928	10	282592	3108520	836502	3945023
121000	ENGINEERING INSPECTION	2286969	2.29	52371	2339340	10	233934	2573274	692468	3265742
	SUBTOTAL 1 ENGINEERING	5112897	1.02	52371	5165268	10	516526	5681795	1528971	7210766
310000	HEALTH PHYSICS TECHNICIAN	722673	2.29	16549	739222	15	110883	850105	0	850105
311AP2	241-AP VALVE PIT MODIFICATIONS	369281	2.29	8456	377737	15	56660	434398	141996	576394
	SUBTOTAL 311AP AP TNK/FRM PIT UPGRADES	369281	2.29	8456	377737	15	56660	434398	141996	576394
311AY1	AY-101 PUMP PIT MODIFICATONS	369281	2.29	8456	377737	15	56660	434398	141996	576394
311AY2	AY-102 PUMP PIT MODIFICATONS	612721	2.29	14031	626753	15	94012	720765	202847	923613
	SUBTOTAL 311AY AY TNK/FRM PIT UPGRADES	982002	2.29	22487	1004490	15	150673	1155164	344843	1500008
311AZ1	AZ-101 PUMP PIT MODIFICATIONS	1098564	2.29	25157	1123721	15	168558	1292279	421021	1713300
311AZ2	AZ-102 PUMP PIT MODIFICATIONS	875134	2.29	20040	895175	15	134276	1029451	341102	1370554
	SUBTOTAL 311AZ AZ TNK/FRM PIT UPGRADES	1973698	2.29	45197	2018896	15	302834	2321730	762124	3083854
312AN1	TANK AN-101 TO GRN/PLD BY-PASS	453422	2.29	10383	463805	15	69570	533376	173643	707019
312AN2	TANK AN-104 TO GRN/PLD BY-PASS	451437	2.29	10337	461775	15	69266	531042	172851	703893
	SUBTOTAL 312AN TOTAL AN TNK/FRM TRNSP/PIPE	904860	2.29	20721	925581	15	138837	1064418	346494	1410913
312AP1	AP-104 TNK/FRM TRO GRN/PLD BY-PASS	24583	2.29	562	25146	15	3772	28918	9658	38577
312AP2	241-AP TNK/FRM TRO GRN/PLD BY-PASS	172810	2.29	3957	176768	15	26515	203283	65896	269180
	SUBTOTAL 312AP TOTAL AN TNK/FRM TRNSP/PIPE	197394	2.29	4520	201914	15	30287	232202	75555	307757
312AY3	AY-101 PUMP PIT TO AY-102 PUMP PIT	1188850	2.29	27224	1216075	15	182411	1398486	432471	1830957

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WBS DESCRIPTION	ESTIMATE	ESCALATION	SUB TOTAL	CONTINGENCY	SUB TOTAL	SUB ALLOCAT'N	SITE TOTAL
12124V AV-102 PUMP PIT TO GRN/PLD BY-PASS	2.29	37443	1672528	15	250879	1923407	624531
SUBTOTAL 12124V			2823935			3321893	1057002
12124Z AZ-101 TRN/FRM TO GRN/PLD BY-PASS	2.29	21375	954424	15	14223	1098088	355618
12124Z1 AZ-101 PUMP PIT TO AZ-102 PUMP PIT	2.29	47691	2110100	15	319545	2449845	771273
SUBTOTAL 12124Z			3016056			3547893	1126892
12124Z2 TOTAL AN TRN/FRM TRNSF/PIPE	2.29	69067	1085124	15	462768	3547893	1126892
SUBTOTAL 12124Z1			10989902			12927807	3854908
12127B FP SECT'R /X-SITE TRANSF TO AN FARM	2.29	12727	568526	30	170558	739084	79676
12127B TRNK FARM GRN/PLD BY PASS AN TO AV	2.29	60012	2680647	30	804192	3756880	3865016
12127B GREEN FIELD VALVE BOX	2.29	21432	957356	30	287208	1244563	54243
SUBTOTAL 12127B			4122353			5468483	5978083
TOTAL X-SITE TRANSF & GRN/P	2.29	94172	4206525	30	1261957	5468483	5978083
SUBTOTAL 122			4122353			5468483	5978083
TOTAL FIXED PRICE CONSTRUCT	2.29	94172	4206525	30	1261957	5468483	5978083
SUBTOTAL 123			15102255			18396290	4364508
TOTAL CONSTRUCTION	2.29	145841	15448097	19	2948193	18396290	4364508
SUBTOTAL 1			6728981			7501064	7501064
OTHER PROJECT COST	1.34	90168	6819149	10	681914	7501064	0
SUBTOTAL 5			6728981			7501064	7501064
OPC COSTS	1.34	90168	6819149	10	681914	7501064	0
SUBTOTAL 000			6728981			7501064	7501064
PROJECT TOTAL	1.81	488,381	27,432,515	15	4,146,635	31,579,150	5,893,480
			26,944,133			37,472,630	

PLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. 2569 (ALT-7B)
 FILE NO. 2569117B
 ** LIST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE XPRR (AN-AZ-AV TO AN FARM)
 ORDER OF MAGNITUDE (ALT-7B)
 PHMCR02 - WORK BREAKDOWN STRUCTURE (WBS) SUMMARY
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 BY JPM/KLR/SME/DKM

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. Z569 (ALT-7B)
FILE NO. Z569117B

** IEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-7B)
PHMCR03 - ESTIMATE BASIS SHEET

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BY JPM/KLR/SNF/DXH

1.. ESTIMATE PURPOSE

ROUGH ORDER OF MAGNITUDE (STUDY) ESTIMATE: THIS ESTIMATE WILL BE USED AS A GUIDELINE TO ESTABLISH COST AND FEASIBILITY OF PROPOSED PROJECT.

2.. ESTIMATE TECHNICAL BASIS

- A. THIS ESTIMATE HAS BEEN PREPARED FOR THE HUMATEC HANFORD INC AS REQUESTED BY FDMW PROJECT MANAGEMENT
B. A DESCRIPTION OF THE TECHNICAL SCOPE OF WORK MAY BE FOUND IN THE FOLLOWING REFERENCE DOCUMENTS:
LOI #LMHC96HO-000 CO-96-THRS-170, DATED FEB. 20, 1998
STATEMENT OF WORK "FEED DELIVERY ESTIMATE" DATED FEB. 25, 1998
PROVIDED PRELIMINARY SKETCHES IN ACCORDANCE WITH DRAWING LIST DATED MAR. 17, 1998
C. THIS ESTIMATE UTILIZES AN ESTIMATE WORK BREAKDOWN STRUCTURE. THE (WBS) IS USED TO DISTINGUISH BETWEEN PROJECT ACTIVITIES AND ALSO MAY BE USED AS A METHOD OF TRACKING PROJECT COSTS AND SCHEDULE.
D. THIS ESTIMATE ALSO UTILIZES A STANDARD FDMW DEFINED CODE OF ACCOUNTS.

3.. ESTIMATE METHODOLOGY

A. DIRECT COSTS:

- (1) A BOTTOMS-UP TECHNIQUE HAS BEEN UTILIZED IN THE PREPARATION OF THIS ESTIMATE. CONSTRUCTION LABOR, MATERIAL AND EQUIPMENT UNITS HAVE BEEN ESTIMATED BASED UPON ONE OR MORE OF THE FOLLOWING STANDARD COMMERCIAL ESTIMATING RESOURCES, PUBLISHED ESTIMATING MANUALS/DATABASES: IN HOUSE DATABASES R. S. MEANS RICHARDSON'S PROCESS PLANT CONSTRUCTION ESTIMATING STANDARDS, NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION, INC. (NECA) MANUAL OF LABOR UNITS. ELECTRICAL RESOURCES, INC. ELECTRICAL ESTIMATING PRICE AND LABOR MANUAL THE UNITS MAY HAVE BEEN FACTORED/ADJUSTED BY THE ESTIMATOR AS APPROPRIATE TO REFLECT INFLUENCES BY CONTRACT, WORK SITE, OR OTHER IDENTIFIED PROJECT OR SPECIAL CONDITIONS.

B. DIRECT COST FACTORS:

- (1) SALES TAX HAS BEEN APPLIED TO ALL MATERIALS AND EQUIPMENT PURCHASES AT 8%.
(2) SPECIAL WORK PROCEDURE (SNP) FACTORS ARE APPLIED AGAINST DIRECT LABOR FOR ACTUAL TIME LOST DUE TO THE PERSONNEL PROTECTIVE EQUIPMENT AND PROCEDURES. THE RATES WHICH HAVE BEEN APPLIED ARE AS FOLLOWS:
PROTECTIVE CLOTHING FACTOR HAS BEEN APPLIED - 40%
MASK WORK - 85% PLUS 15% FOR PROTECTIVE CLOTHING.

(3) GENERAL FOREMAN FACTOR OF 7% HAS BEEN APPLIED TO DIRECT CRAFT LABOR CREWS.
(4) ONSITE A/CN CONSTRUCTION FORCES INCLUDE A 33% CONTRACT ADMINISTRATION FACTOR AND A 38% GENERAL REQUIREMENTS FACTOR. OFFSITE CONSTRUCTION FORCES INCLUDE A 19.90% CONTRACT ADMINISTRATION FACTOR. APPLIED FACTORS INCLUDE COSTS FOR BID PACKAGE PREPARATION, CONTRACT MANAGEMENT & ADMINISTRATION AND PROJECT MANAGEMENT & PLANNING.
(5) A FACTOR OF 10% HAS BEEN APPLIED TO DIRECT CRAFT LABOR TO ALLOW FOR USAGE OF GOVERNMENT OWNED EQUIPMENT CONTROLLED BY DYNACORP.

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. 2569 (ALT-78)
FILE NO. 25691178

** BEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XPER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-7B)
PHMCR03 - ESTIMATE BASIS SHEET

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C. INDIRECT COSTS:

FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS HAVE BEEN APPLIED ARE THE FOLLOWING PERCENTAGES:
LABOR 25%, EQUIPMENT USE - 0%, MATERIAL -25%, SUBCONTRACT -10%, AND EQUIPMENT - 0% , AND ARE REFLECTED IN THE
"OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL REPORT.

D. RATES:

- (1) FOR ESTIMATING PURPOSES, AVERAGE FDNW RATES BY OPERATION CODE HAVE BEEN DEVELOPED BASED UPON RECENT COST HISTORY AND ADJUSTED TO REFLECT INDUSTRY AVERAGE AE/CM RATES.
- (2) FLUOR DANIEL NORTHWEST SERVICES (CONSTRUCTION CRAFT LABOR) RATES ARE THOSE LISTED IN APPENDIX A TO THE HANFORD SITE STABILIZATION AGREEMENT (HSSA). THE HSSA RATES INCLUDE BASE WAGE, PRIME BENEFITS AND OTHER COMPENSATION AS NEGOTIATED BETWEEN FLUOR DANIEL HANFORD, INC. AND THE NATIONAL BUILDING AND CONSTRUCTION TRADES DEPARTMENT AFL-CIO. FLUOR DANIEL NORTHWEST COST ESTIMATING INCORPORATES FACTORS TO COVER ADDITIONAL COSTS FOR WORKMEN COMPENSATION, FICA, STATE AND FEDERAL UNEMPLOYMENT INSURANCE AND G&A/FEE TO DEVELOP A FULLY BURDENED RATE BY CRAFT.

E. SITE ALLOCATIONS FACTORS:

- SITE ALLOCATION FACTORS ARE DEVELOPED AND PROVIDED BY FLUOR DANIEL HANFORD (FDH) FOR ESTIMATING USE.
- (1) GOVERNMENT FURNISHED SERVICES RATE IS APPLIED TO ALL COSTS TO LIQUIDATE GOVERNMENT FURNISHED SERVICES PROVIDED THE ENTERPRISE COMPANIES. 7% FOR FDNW AND FDNWS (CONSTRUCTION)
 - (2) HANFORD SITE G&A AND ESS FOR FY8 (18%) FY 99 (15%), FY 00 (22%) WERE APPLIED TO ALL COSTS TO LIQUIDATE THE HANFORD GENERAL & ADMINISTRATIVE COSTS AND ESSENTIAL SITE SERVICES (I.E. FIRE, WATER ELECTRICAL, ETC.)

FDNW APPLIED THE ABOVE FACTORS TO ESTIMATED COSTS AS FOLLOWS:

- (1) FDH CFS/G&A - LABOR FACTOR: A COMPOSITE FACTOR BASED UPON FY 98 THRU FY 00 RATES HAVE BEEN APPLIED TO TOTAL FDNW LABOR COST AS FOLLOWS:
A/E (TITLE II ONLY) COSTS = 34.52, AE/CM COSTS = 26.26%, FDNWS CONSTRUCTION LABOR = 26.66%
- (2) FDH MPR/G&A MATERIAL FACTOR: A COMPOSITE FACTOR OF 25.83% BASED UPON FY 98 THRU FY 00 RATES HAS BEEN APPLIED TO FDNW CONSTRUCTION MATERIAL. FDNW PROCUREMENTS A COMPOSITE FACTOR OF 24.96% HAS BEEN APPLIED BASED UPON FY 98 AND FY99 RATES.

4. ESCALATION

=====

SCHEDULE PROVIDED

5. CONTINGENCY

=====

A. DEFINITION OF CONTINGENCY AS PROVIDED BY DOE

"CONTINGENCY COVERS COSTS THAT MAY RESULT FROM INCOMPLETE DESIGN, UNFORESEEN AND UNPREDICTABLE CONDITIONS, OR UNCERTAINTIES WITHIN THE DEFINED PROJECT SCOPE. THE AMOUNT OF CONTINGENCY WILL DEPEND ON THE STATUS OF DESIGN, PROCUREMENT AND CONSTRUCTION, AND THE COMPLEXITY AND UNCERTAINTIES OF THE COMPONENT PARTS OF THE PROJECT. CONTINGENCY IS NOT TO BE USED TO AVOID MAKING AN ACCURATE ASSESSMENT OF EXPECTED COST" (OFFICE OF WASTE MANAGEMENT (EM-30) COST AND SCHEDULE GUIDE.

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. Z569 (ALT-7B)
FILE NO. Z5691L7B

** IEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-7B)
PHMCRO3 - ESTIMATE BASIS SHEET

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B. CONTINGENCY ALLOWANCE GUIDELINES

THE DOE GUIDELINE (REF. 5700.3) CONTINGENCY ALLOWANCE FOR A STUDY ESTIMATE (STANDARD 20%-30%) (EXPERIMENTAL 30%-50%)

C. METHODOLOGY

CONTINGENCY IS EVALUATED AT THE LOWEST WORK BREAKDOWN STRUCTURE (WBS) LEVEL WITHIN THE COST ESTIMATE DETAILS. IT IS SUMMARIZED AT UPPER WBS LEVELS AND REPORTED ON THE SUMMARY REPORTS.

D. ANALYSIS

AN ASSESSMENT OF DESIGN MATURITY, WORK COMPLEXITY AND PROJECT UNCERTAINTIES HAS BEEN PERFORMED. AN EXPLANATION OF THIS ASSESSMENT AND CONTINGENCY RATES WHICH HAVE BEEN ADDED TO THE COST OF WORK ARE AS FOLLOWS:

ENGINEERING:

WBS 11/12/50

AN AVERAGE CONTINGENCY OF 10% WAS APPLIED TO ENGINEERING AND OPERATING CONTRACTOR COSTS DUE TO THE PERCENTAGE METHOD USED TO ATTAIN COSTS.

CONSTRUCTION:

WBS 311A

AN AVERAGE 15% CONTINGENCY IS APPLIED TO 241-AP VALVE PIT MODIFICATIONS DUE TO UNKNOWN PIT CONTAMINATION AND WHAT TYPE OF RADIATION IS PRESENT. AN ALLOWANCE FOR PIT DECONTAMINATION HAS BEEN ESTIMATED AND THE FINAL STUDY ON HOW THE PITS CAN BE DECON IS FORTH COMING. NO DETERMINATION HAS BEEN MADE AS TO THE DISPOSAL REQUIREMENTS, ALSO RADIATION LEVEL HAS NOT BEEN ESTABLISHED. THEREFORE TYPE OF SMP COSTS MAY HAVE TO BE ADJUSTED AND SOME FUNDING FOR BURNOUT MAY BE REQUIRED.

WBS 311AY

AN AVERAGE 15% CONTINGENCY IS APPLIED TO AY TANK FARM PUMP PIT MODIFICATIONS DUE TO UNKNOWN CONTAMINATION ELEVATIONS AND POSSIBLE SCHEDULING PROBLEMS DURING RETROFIT OF PIT JUMPERS. IF CONTAMINATION LEVELS ARE HIGHER THAN ANTICIPATED COST FOR RADIATION CONTAINMENT, SUCH AS, GREEN HOUSE, STEP OFF PAD, AND HEPA FILTRATION SYSTEMS WILL INCREASE COSTS, IF WORK CREWS ARE UNABLE TO MAKE JUMPER CHANGE-OUTS DURING REGULAR WORKING HOURS AND HAVE TO COMPLETE JUMPER INSTALLATION DURING PREMIUM TIME, LABOR COSTS WILL INCREASE SIGNIFICANTLY.

WBS 311AZ

AN AVERAGE 15% CONTINGENCY IS APPLIED TO AZ TANK FARM PUMP PIT MODIFICATIONS BECAUSE ADDITIONAL PIPING FLUSHING NECESSARY TO REDUCE RADIATION LEVEL IN ORDER TO REMOVE JUMPERS. ADDITIONAL FLUSHING WILL ADD TO CRAFT DOWN TIME WHILE WAITING FOR TESTING AND COMPLETION OF FLUSHING OPERATIONS.

FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. Z569 (ALT-7B)
FILE NO. Z5691L7B

** IEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-7B)
PHMCR03 - ESTIMATE BASIS SHEET

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WBS 312AN, AY, AZ

AN AVERAGE OF 15% CONTINGENCY IS APPLIED TO PIPELINE WORK DUE TO THE UNDERGROUND OBSTRUCTION THAT MAY CAUSE GRADE CHANGES, ROUTING CHANGES AND WORK METHOD DUE TO THE CONTAMINATION PRESENT DURING EXCAVATION. TESTING METHODS MAY BE CHANGED UPON OPERATIONS FINAL APPROVAL OF LEAVING COVER BLOCKS OFF FOR DURATION OF CONSTRUCTION. A UNDERGROUND SCAN HAS BEEN DONE DUE EXACT DEPTH AND OBJECT INDEMNIFICATION IS NO CLEAR. DUE TO THESE UNCERTAINTIES MORE SAFETY PRECAUTIONS MAY BE NEEDED UNTIL DISCOVER OF THESE UNKNOWNNS ARE UNCOVERED. ALSO FLUCTUATIONS IS COSTS WILL NECESSITATE ADDITIONAL CONSTRUCTION SUPPORT COSTS.

WBS 32

AN AVERAGE OF 30% CONTINGENCY IS APPLIED TO "GREEN FIELD CONSTRUCTION" DUE TO UNKNOWN OBSTRUCTION BOTH BELOW AND ABOVE GROUND THAT WILL HAVE TO BE RELOCATED OR PIPELINE ROUTING WILL HAVE TO BE CHANGED. NEW PIPELINE BERMS MAY GO OVER EXISTING, DRAIN, LINES, DRAIN FIELDS, PROCESS AND RAW WATER LINE VALVE PITS. IF THIS OCCURS EXISTING LINES WILL HAVE TO BE RELOCATED OR NEW PIPING WILL BE REROUTED IN EITHER CASE ADDITIONAL COSTS WILL BE NEEDED TO FUND SUCH OPERATIONS.

6. ROUNDING

ESTIMATE ROUNDED AND ADJUSTED

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED WESBETH INC
JOB NO. 2569 (ALT-7B)
FILE NO. 2569AL7B

** TEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE . (ALT-7B)
PHMCR03 - ESTIMATE BASIS SHEET

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7. REMARKS

MAJOR ASSUMPTIONS WHICH HAVE BEEN MADE IN THE PREPARATION OF THIS ESTIMATE ARE AS FOLLOWS:

EXCAVATION ASSUMPTIONS:

- A.) ALL TRENCH EXCAVATIONS INSIDE FARM AREA ESTIMATED TO BE COMPLETED BY HAND.
- B.) ASSUME MACHINE ASSISTANCE ON TRENCH BACKFILL. THIS INCLUDES DUMP TRUCK & LOADER
- C.) ASSUME ALL FILL FOR SHIELDING BERM WILL BE AVAILABLE IN TANK FARM.
- D.) ASSUME ALL COP CAN BE PLACED IN FOUR DAYS. HOSE/DEMOLIS WAS ESTIMATED FOR FOUR DIFFERENT DAYS.
- E.) ESTIMATE INCLUDES NINE POT HOLE LOCATIONS AS MARKED ON DNGS BY CONSTRUCTION MANAGER. THESE POT HOLES ARE ONLY FOR GRADE MARKS. THE POT HOLES ARE FIGURED USING THE GUZZLER TO SEE EFFECTIVENESS OF MACHINE.
- F.) SHIELDING BERM FIGURED TO HAVE A FOUR FOOT FLAT TOP WITH 2 TO 1 SLOPES.

PIPELINE (MECHANICAL) ASSUMPTIONS:

- A.) ASSUME ESTIMATE DOES NOT REQUIRE DRAIN FROM A2 PIT.
- B.) ASSUME DEMO'D MATERIALS WILL BE BURIED AS LLW.
- C.) APPLIED BY PIT MODIFICATION AMOUNT TO AP PIT MODIFICATIONS. NO DIRECTION OR DETAIL WERE PROVIDED.
- D.) ASSUME EXCAVATION MATERIALS TO BE HANDLED DURING GREEN FIELD PORTION OF PROJECT WILL BE FREE FROM ANY CONTAMINATION RADIATION OR OTHERWISE.
- E.) ASSUME PIPING CONNECTION TO AN TANK FARM PITS A & B WILL BE OUTSIDE OF PIT. FUNDING FOR REMOVAL & REPLACEMENT OF COVER BLOCKS IN NOT IN ESTIMATE. ALSO RETROFITTING OF JUMPERS IS NOT IN ESTIMATE.
- F.) ASSUME PROCEDURES WILL ALLOW SENSITIVE LEAK TEST OF PIPING AT W-058 CROSS SITE TRANSFER.
- G.) ASSUME LIQW-720 MODIFICATIONS WILL NOT BE ADDRESSED BY THIS PROJECT.
- H.) ASSUME REVISIONS TO CANTON AVE WILL NOT BE REQUIRED.
- I.) ASSUME MASTER PUMP SHUTDOWN WILL BE PROVIDED BY ANOTHER PROJECT. FUNDING IS NOT IN THIS ESTIMATE.

ELECTRICAL & INSTRUMENTATION:

- A.) ELECTRICAL WORK PERFORMED OUTSIDE OF THE TANK FARM, WITH NO SWP FACTOR APPLIED INCLUDES: TERMINAL BOXES CONTROL ENCLOSURES, INSTALLING CONDUITS/FITTINGS SIZE AND CABLE.
- B.) CATHODIC PROTECTION WILL BE PLACED WHEN THE TRENCH WALLS ARE SHORED.
- C.) ANODE HEADER AND LOOP WILL BE IN THE SAME TRENCH AS PIPE IS RUN.

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FLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. 2569 (ALT-7B)
 FILE NO. 25691L7B

** IEST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE XPER (AN-AZ-AY TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-7B)
 PHMCR04 - COMPANY/WBS SUMMARY

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SORT CODE/WBS	DESCRIPTION	ESTIMATE	ESCALATION	SUB	CONTINGENCY	SUB	SITE	TOTAL		
		SUBTOTAL	% TOTAL	TOTAL	% TOTAL	TOTAL	ALLOCAT'N	DOLLARS		
(Description not available)										
111000	DEFINITIVE DESIGN	2825928	0.00	0	2825928	10	282592	3108520	1080832	4189353
	SUBTOTAL 11 ENGINEERING	2825928	0.00	0	2825928	10	282592	3108520	1080832	4189353
	SUBTOTAL 1 ENGINEERING	2825928	0.00	0	2825928	10	282592	3108520	1080832	4189353
500000	OPC COSTS	6728981	1.34	90168	6819149	10	681914	7501064	0	7501064
	SUBTOTAL 5 OTHER PROJECT COST	6728981	1.34	90168	6819149	10	681914	7501064	0	7501064
	TOTAL (Description not available)	9554909	0.94	90168	9645077	10	964507	10609585	1080832	11690417
FDN	FLUOR DANIEL HANFORD, INC.									
310000	HEALTH PHYSICS TECHNICIAN	722673	2.29	16549	739222	15	110883	850105	0	850105
	SUBTOTAL 31 TOTAL C/FORCES CONSTRUC	722673	2.29	16549	739222	15	110883	850105	0	850105
	SUBTOTAL 3 TOTAL CONSTRUCTION	722673	2.29	16549	739222	15	110883	850105	0	850105
	TOTAL FDH FLUOR DANIEL HANFORD, INC.	722673	2.29	16549	739222	15	110883	850105	0	850105
FDNW	FLUOR DANIEL NORTHWEST									
121000	ENGINEERING INSPECTION	2286969	2.29	52371	2339340	10	233934	2573274	894727	3468002
	SUBTOTAL 1 ENGINEERING	2286969	2.29	52371	2339340	10	233934	2573274	894727	3468002
311AP2	241-AP VALVE PIT MODIFICATIONS	369281	2.29	8456	377737	15	56660	434398	141996	576394
	SUBTOTAL 311AP AP TNK/PRM PIT UPGRADES	369281	2.29	8456	377737	15	56660	434398	141996	576394
311AY1	AY-101 PUMP PIT MODIFICATONS	369281	2.29	8456	377737	15	56660	434398	141996	576394

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 Revision 0

FLUOR DANIEL NORTHWEST, INC.
 NUMATEC HANFORD INC.
 JOB NO. W-314ALT
 FILE NO. W314BA12

**** TEST - INTERACTIVE ESTIMATING ****
 FEED DELIVERY CONCEPTUAL DESIGN - COST SAVINGS
 PHASE 11 OPC'S, DESIGN & CONST. AN,AP,AW,AY,AZ,2E/W
 PHMCR01 - PROJECT COST SUMMARY

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SORT	DESCRIPTION	ESCALATED	CONTINGENCY		TOTAL
		TOTAL COST	%	TOTAL	DOLLARS
DESH	DE&S HANFORD, INC.	40,000	10	0	40,000
FDH	FLUOR DANIEL HANFORD, INC.	1,130,000	10	110,000	1,240,000
FDNW	FLUOR DANIEL NORTHWEST	18,710,000	25	4,600,000	23,310,000
LHNC	LOCKHEED MARTIN HANFORD CORP.	760,000	10	80,000	840,000
LMSI	LOCKHEED MARTIN SERVICES, INC.	60,000	20	10,000	70,000
NHC	NUMATEC HANFORD CORPORATION	1,980,000	10	200,000	2,180,000
RL	DOE RICHLAND OPERATIONS	40,000	10	0	40,000
SUBTOTAL		22,720,000	22	5,000,000	27,720,000
SITE	SITE ALLOCATIONS	5,670,000	25	1,440,000	7,110,000
	(ADJUSTED TO MEET DOE 5100.4)				
PROJECT TOTAL		28,390,000	23	6,440,000	34,830,000

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TYPE OF ESTIMATE	REMARKS:
FDNW LEAD ESTIMATOR	ESTIMATING MANAGER
PROJECT MANAGER	
CLIENT	

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

FLUOR DANIEL NORTHWEST, INC.
 NUMATEC HANFORD INC.
 JOB NO. W-314ALT
 FILE NO. W314BAT

**** TEST - INTERACTIVE ESTIMATING ****
 FEED DELIVERY CONCEPTUAL DESIGN - COST SAVINGS
 PHASE II OPC'S, DESIGN & CONST. AN, AP, AN, AY, AZ, ZE/W
 PHNCRO2 - WORK BREAKDOWN STRUCTURE (WBS) SUMMARY

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WBS	DESCRIPTION	ESTIMATE		ESCALATION		SUB		CONTINGENCY		SUB	SITE	TOTAL
		SUBTOTAL	%	TOTAL	TOTAL	TOTAL	%	TOTAL	TOTAL			
1A	PK & INTEGRATION	635510	12.74	80964	716474	10	71647	788121	0	788121		
1B	PROJ ENGINEERING	224708	12.74	28628	253336	10	25334	278670	0	278670		
1C	SE MANAGEMENT	28560	12.74	3639	32199	10	3220	35419	0	35419		
1D	QUALITY ASSURANCE	167448	12.74	21333	188781	10	18878	207659	69131	276790		
SUBTOTAL 1 PROJECT MGMT PHASE II		1056226	12.74	134564	1190790	10	119079	1309869	69131	1379000		
2A	PERMITTING	4900	12.73	624	5524	10	552	6076	0	6076		
2B	SAFETY ANALYSIS	36126	12.74	4602	40728	10	4073	44801	0	44801		
SUBTOTAL 2 PERMITTING & SAFETY PHASE II		41026	12.74	5226	46252	10	4625	50877	0	50877		
3C	DESIGN & CONST. SUPPORT	348805	12.74	44438	393243	10	39324	432567	0	432567		
3K	STARTUP TESTING	863155	12.74	109966	973121	10	97312	1070433	0	1070433		
3L	OPERATIONS PREPARATION	324132	12.74	41294	365426	10	36543	401969	0	401969		
3M	INDEPENDENT REVIEWS	36000	12.74	4586	40586	10	4059	44645	0	44645		
SUBTOTAL 3 OPC ACTIVITIES PHASE II		1572092	12.74	200284	1772376	10	177238	1949614	0	1949614		
4B	CONSTRUCTION (AP-102/104 SN-650)	425102	3.78	16056	441158	22	98655	539813	176735	716548		
SUBTOTAL 4 W-211		425102	3.78	16056	441158	22	98655	539813	176735	716548		
5A	AN TANK FARM	151672	15.60	23655	175327	25	44672	219999	70217	290216		
5B	AP FARM	161444	18.22	29414	190858	26	49619	240477	76995	317472		
5C	AW TANK FARM	162090	15.67	25397	187487	27	50222	237709	76305	314014		
5D	AY TANK FARM	1562091	23.36	364973	1927064	23	436081	2363145	790682	3153827		
5E	AZ TANK FARM	559363	19.27	107780	667143	23	155147	822290	278079	1100369		
5I	200 EAST/WEST AREA	12518136	28.78	3603234	16121370	24	3869581	19990951	5567830	25558781		
SUBTOTAL 5 PHASE 2		15114796	27.49	4154433	19269249	24	4605322	23874571	6860108	30734679		
PROJECT TOTAL		18,209,242	24.77	6,510,583	22,719,825	22	5,004,919	27,724,744	7,105,974	34,830,718		

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FLOOR DANIEL NORTHWEST, INC.
10000 10TH AVE. N.W.
JOB NO. W-314ALT
FILE NO. W314ALT

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** TEST - INTERACTIVE ESTIMATING **
FEED DELIVERY CONCEPTUAL DESIGN - COST SAVINGS
PHASE III OPC'S, DESIGN & CONST. AM, AP, AV, AT, AZ, 2E / U
PHMCROS - ESTIMATE BASIS SHEET

1. ESTIMATE PURPOSE
ORDER OF MAGNITUDE ESTIMATE: THIS ESTIMATE WILL TO BE USED TO DETERMINE POTENTIAL COST SAVINGS IN THE W-314 PROJECT RESULTING FROM INSTALLATION OF ONE OF THE FEED DELIVERY CONCEPTS.
2. ESTIMATE TECHNICAL BASIS
A. THIS ESTIMATE HAS BEEN PREPARED FOR THE FEED DELIVERY CONCEPTUAL DESIGN PROJECT AS REQUESTED BY NUMATEC HANFORD COMPANY.
B. WORK SCHEDULE UTILIZES AN ESTIMATE WORK BREAKDOWN STRUCTURE WHICH INTERFACES WITH THE PROJECT WORK BREAKDOWN STRUCTURE
C. AS PROVIDED BY PROJECT MANAGEMENT.
3. ESTIMATE METHODOLOGY
A. PARAMETRIC TECHNIQUE HAS BEEN UTILIZED IN THE PREPARATION OF THIS ESTIMATE.
(1) CONSTRUCTION LABOR, MATERIAL AND EQUIPMENT UNITS HAVE BEEN ESTIMATED BASED UPON THE W-314 ODR ESTIMATE DATED JULY 27 1997. THE UNITS MAY HAVE BEEN FACTORED/ADJUSTED BY THE ESTIMATOR AS APPROPRIATE TO REFLECT INFLUENCES BY CONTRACT, WORK SITE, OR OTHER IDENTIFIED PROJECT OR SPECIAL CONDITIONS.
B. DIRECT COST FACTORS:
(1) SALES TAX HAS BEEN APPLIED TO ALL MATERIALS AND EQUIPMENT PURCHASES AT 8%.
(2) A FACTOR OF 15% HAS BEEN APPLIED TO DIRECT CRAFT LABOR FOR GENERAL REQUIREMENTS & 23.58% FOR TECHNICAL SERVICES.
(3) CONSUMABLES AND OCCUPATIONAL SAFETY FACTORS ARE APPLIED AGAINST DIRECT LABOR FOR ACTUAL TIME LOST DUE TO THE PERSONNEL PROTECTIVE EQUIPMENT AND PROCEDURES. THE RATES WHICH HAVE BEEN APPLIED ARE AS FOLLOWS:
PROTECTIVE CLOTHING FACTOR HAS BEEN APPLIED = 40%
PROTECTIVE CLOTHING FACTOR OF 10% FOR PROTECTIVE CLOTHING CRAFT LABOR CREWS.
(5) MASK WORK = 85% PLUS 15% FOR PROTECTIVE CLOTHING CRAFT LABOR TO ALLOW FOR USAGE OF GOVERNMENT OWNED EQUIPMENT CONTROLLED BY DYNCORP.
C. RATES:
(1) FOR ESTIMATING PURPOSES, AVERAGE EDWH RATES BY OPERATIONS CODE HAVE BEEN DEVELOPED BASED UPON RECENT COST HISTORY FOR DANIEL NORTHWEST TO REFLECT INDUSTRY AVERAGE AE/CM RATES.
(2) FLOOR DANIEL NORTHWEST SERVICES (CONSTRUCTION CRAFT LABOR) RATES ARE THOSE LISTED IN APPENDIX A OF THE HANFORD SITE STABILIZATION AGREEMENT (HSSA). THE HSSA RATES INCLUDE BASE WAGE, PRIME BENEFITS AND OTHER COMPENSATION OF FLOOR DANIEL NORTHWEST FLOOR DANIEL HANFORD, INC. AND THE NATIONAL BIDDING ADDITIONAL COSTS FOR WORKMAN'S COMPENSATION, FICA, STATE AND FEDERAL UNEMPLOYMENT INSURANCE AND GSA/FEE TO DEVELOP A FULLY BURDENED RATE BY CRAFT.
E. SITE ALLOCATIONS FACTORS:
(1) DYNCORP EQUIPMENT USAGE: APPLIED TO HOME OFFICE ENGINEERING FOR GOVERNMENT OWNED EQUIPMENT CONTROLLED BY DYNCORP @ .25%
(2) GOVERNMENT FURNISHED SEXY FOR FSW OR 10% FOR EDWH (CONSTRUCTION).
(3) HANFORD SITE GENERAL ADMINISTRATIVE (G&A): APPLIED TO ALL COSTS TO LIQUIDATE THE COST OF HANFORD GENERAL AND HANFORD SITE MATERIAL PROCUREMENT RATE (MPR): APPLIED TO ALL PURCHASED MATERIAL AND SERVICES TO LIQUIDATE THE COST OF PROCUREMENT, RECEIVING AND WAREHOUSING 7.0%.

FLUOR DANIEL NORTHWEST, INC.
JOB NO. W-31471
FILE NO. W31471
** TEST - INTERACTIVE ESTIMATING **
FEED DELIVERY CONCEPTUAL DESIGN - COST SAVINGS
PHASE II OPT'S, DESIGN & CONST. ANALYSIS, AZ, ZE/V
P/MCRO3 - ESTIMATE BASIS SHEET
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THE ABOVE FACTORS ARE APPLIED TO ESTIMATED COSTS AS SHOWN IN THE P/MCRO6 REPORT.
(1) DYNACORP EQUIPMENT USAGE: 0.25% APPLIED TO HOME OFFICE ENGINEERING AND CONSTRUCTION MANAGEMENT LABOR; 10% APPLIED TO
CONSTRUCTION LABOR.
(2) FOR GSA/GEA CONST. MGMT: GSA (14%) AND GEA (18.0%) COMPOUNDED AND APPLIED TO FIXED PRICE SUBCONTRACTS.
(3) FOR SUBCONTRACT - GSA/FEER RATE (7.7%) APPLIED TO FIXED PRICE SUBCONTRACTS.
(4) FOR GSA/GEA - LABOR: GFS (14% OR 10%) AND GEA (18.0%) COMPOUNDED AND APPLIED TO HOME OFFICE ENGINEERING AND CONSTRUCTION
MANAGEMENT LABOR, 34.52% OR TO P/MNS CONSTRUCTION LABOR, 29.80%.
(5) FOR MFR/GEA - MATERIAL: MFR (7.0%) AND GEA (18.0%) COMPOUNDED AND APPLIED TO MATERIAL, 26.26%.
ESCALATION

4. ESCALATION
PERCENTAGES AS FOUND IN THE W-314 REV. 7 DATED JULY 27, 1997 ESTIMATE WERE USED FOR THIS EFFORT.

5. ROUNDING
THE PROJECT COST SUMMARY REPORT IS SUMMARIZED AND ADJUSTED/ROUNDED AS FOLLOWS:
THE ESCALATED TOTAL COST COLUMN, CONTINGENCY TOTAL COLUMN AND TOTAL DOLLAR SUB-TOTALS ARE SUMMARIZED BY CONTRACTOR.
ADJUSTED/ROUNDED TO THE NEAREST \$10,000/\$100,000.
THE COLUMN SUBTOTALS ARE ADJUSTED/ROUNDED TO THE NEAREST \$1,000/\$10,000. THE PROJECT TOTAL SUMMARY LINE TOTALS ARE
6. REMARKS
MAJOR ASSUMPTIONS WHICH HAVE BEEN MADE IN THE PREPARATION OF THIS ESTIMATE ARE AS FOLLOWS:
A.) CONTINGENCY PERCENTAGES ARE THOSE FOUND IN THE W-314 REV. 7 ESTIMATE DATED JULY 27, 1997.
B.) THE COSTS FOR DELETED ITEMS ARE THOSE AREAS DISCUSSED IN A MEETING WITH THE W-314 PROJECT LEAD ENGINEER (MARK RICKENBACH),
OF THE FEED DELIVERY SYSTEM.

1. AN TANK FARM
5A210 TITLE 11
5A400 GENERAL REQUIREMENTS
5A4J10 INSTRUMENTATION FLUSH PIT
5A4K01 PROJECT SUPPORT CONST.
5A4J24 INSTRUMENTATION CLEANOUT BOXES
2. AN TANK FARM
5A100 HPI SUPPORT
5A210 TITLE 11
5A400 GENERAL REQUIREMENTS
5A4J10 INSTRUMENTATION FLUSH PIT
5A4K01 PROJECT SUPPORT CONST.
5A4J24 INSTRUMENTATION CLEANOUT BOXES
ON PERCENTAGES CALCULATED FROM DIRECT CONSTRUCTION COST SAVINGS AS FOUND IN
TITLE 11, 111, GENERAL REQUIREMENTS, CONSTRUCTION SUPPORT AND HPI'S ARE BASED
ON PERCENTAGES CALCULATED FROM DIRECT CONSTRUCTION COST SAVINGS AS FOUND IN
TITLE 11, 111, GENERAL REQUIREMENTS, CONSTRUCTION SUPPORT AND HPI'S ARE BASED

58100 HPI TITLE 11
58100 GENERAL REQUIREMENTS
584J10 INSTRUMENTATION FLUSH PIT
584J24 INSTRUMENTATION CLEANOUT BOXES
584M01 PROJECT SUPPORT CONST.
586100 HPI SUPPORT

FLUOR DANIEL NORTHWEST, INC.
NUMATEC HANFORD INC.
JOB NO. W-314ALT
FILE NO. W314ALT

** IEST - INTERACTIVE ESTIMATING **
FEED DELIVERY CONCEPTUAL DESIGN - COST SAVINGS
PHASE II OPC'S, DESIGN & CONST. AM,AP,AW,AY,AZ,2E/W
PHMCRO3 - ESTIMATE BASIS SHEET

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3. AW TANK FARM
5C1101 TITLE II
5C2101 TITLE III
5C4100 GENERAL REQUIREMENTS
5C4J10 INSTRUMENTATION FLUSH PIT
5C4J24 INSTRUMENTATION CLEANOUT BOXES
5C4K01 CONSTRUCTION SUPPORT
5C6100 HPT SUPPORT

TITLE II, III, GENERAL REQUIREMENTS, CONSTRUCTION SUPPORT AND HPT'S ARE BASED ON PERCENTAGES CALCULATED FROM DIRECT CONSTRUCTION COST SAVINGS AS FOUND IN WBS'S 5C4J10 & 5C4J24.

4. AY TANK FARM
5D1101 DRAWINGS
5D2101 ENGINEERING SUPPORT
5D4A09 TANK 101 SLUCE PIT B
5D4A10 TANK 101 SLUCE PIT C
5D4B09 TANK 102 SLUCE PIT B
5D4B10 TANK 102 SLUCE PIT C
5D4100 GENERAL REQUIREMENTS
5D4K09 PROJECT SUPPORT CONST.
5D6100 HPT SUPPORT

TITLE II, III, GENERAL REQUIREMENTS, CONSTRUCTION SUPPORT AND HPT'S ARE BASED ON PERCENTAGES CALCULATED FROM DIRECT CONSTRUCTION COST SAVINGS AS FOUND IN WBS'S 5D4A09, 5D4A10, 5D4B09, & 5D4B10.

5. AZ TANK FARM
5E1101 TITLE II
5E2101 TITLE III
5E4A10 TANK 101 SLUCE PIT C
5E4B09 TANK 102 SLUCE PIT B
5E4100 GENERAL REQUIREMENTS
5E4J24 INSTRUMENTATION CLEANOUT BOX
5E4K09 PROJECT SUPPORT CONST.
5E6100 HPT SUPPORT

TITLE II, III, GENERAL REQUIREMENTS, CONSTRUCTION SUPPORT AND HPT'S ARE BASED ON PERCENTAGES CALCULATED FROM DIRECT CONSTRUCTION COST SAVINGS AS FOUND IN WBS'S 5E4A10, 5E4B09, & 5E4J24.

6. 200 E/W
511101 TITLE II
512102 TITLE III
514A00 GENERAL REQUIREMENTS
514B00 GENERAL REQUIREMENTS
514C00 AX-A VLV PIT UPGRADES
514D01 Electrical/Instrumentation
514E01 A-A VALVE PIT UPGRADES
514F01 200 E/W A-A & A-B SITework
514112 EXCEPTIONS WORK OFF
514K09 PROJECT SUPPORT CONST.
516100 HPT SUPPORT

THIS SCOPE OF WORK PER DISCUSSION WILL BE COMPLETELY DELETED WITH THE INSTALLATION OF THE PROPOSED FEED DELIVERY SYSTEM. THE COST SAVINGS FOUND IN THE ESTIMATE REFLECTS THE AMOUNT FOUND IN THE W-314 REV. 7 ESTIMATE.

7. SAVINGS FOR PHASE II OTHER PROJECT COSTS (WBS'S 1, 2 & 3) ARE BASED ON PERCENTAGES OF THE TOTAL COST SAVINGS FOR EACH FARM.
WBS 5A AX (1X), WBS 5B AP (1X), WBS 5C AW (1X), WBS 5D AY (22X), WBS 5E AZ (9X) & WBS 5I 200 E/W (100X).

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FLUOR DANIEL NORTHWEST, INC.
 MUMATEC HANFORD INC.
 JOB NO. W-314ALT
 FILE NO. W514BA12

** TEST - INTERACTIVE ESTIMATING **
 FEED DELIVERY CONCEPTUAL DESIGN - COST SAVINGS
 PHASE II OPC'S, DESIGN & CONST. AK, AP, AW, AY, AZ, 2E/W
 PHMCROB - ESTIMATE DETAIL BY WBS / COST CODE

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ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / S & I	TOTAL DOLLARS
1A0101	PH & INTEGRATION										
1A0101.99	SUBCONTRACTOR LABOR										
1A0101.9900100	COST SAVINGS PH/INTEGRATION	060	1 LS	8657	635510	0	0	0	0	0	635510
	SUBTOTAL SUBCONTRACTOR LABOR			8,657	635,510	0	0	0	0	0	635,510
	TOTAL COST CODE 06099			8,657	635,510	0	0	0	0	0	635,510
	WBS 1A0101 (ESCALATION 12.74% - CONTINGENCY 10.00 %)										
	TOTAL WBS 1A0101 PH & INTEGRATION			8,657	635,510	0	0	0	0	0	635,510

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DUPLICATE

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BY JFM/KER/SWF/DKH

** TEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER (AN-AZ-AV TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-3)
PHMCR01 - PROJECT COST SUMMARY

FLUOR DANIEL NORTHWEST, INC.
FLUOR DANIEL MARTIN SERVICES INC
JOB NO. 2569 (ALT-3)
FILE NO. 25691AT3

DESCRIPTION	ESCALATED TOTAL COST	CONTINGENCY	TOTAL DOLLARS
FLUOR DANIEL HANFORD, INC.	1,050,000	15	1,210,000
FLUOR DANIEL NORTHWEST	25,190,000	15	29,000,000
LOCHESD MARTIN HANFORD CORP.	8,530,000	10	9,380,000
SUBTOTAL	34,770,000	14	39,590,000
SITE ALLOCATIONS	7,750,000	14	8,850,000
(ADJUSTED TO MEET DOE \$100.4)	-20,000		-40,000
PROJECT TOTAL	42,500,000	14	48,400,000

DRAFT

REMARKS:

TYPE OF ESTIMATE: ROUGH ORDER OF MAGNITUDE

ESTIMATOR: J. MOKLER

MANAGER: J. CUMMINGS

CLIENT: HUBATEC

ALT #3

(ROUNDED/ADJUSTED TO THE NEAREST * 10,000 / 100,000 * - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

PLUOR DANIEL NORTHWEST, INC.
 LOCKHEAD MARTIN SERVICES INC
 JOB NO. 2569 (ALT-3)
 FILE NO. 2569(ALT)

** TEST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE XFER (AN-AZ-AV TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-3)
 PHMC02 - WORK BREAKDOWN STRUCTURE (NBS) SUMMARY

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 BY JPN/KLR/SMP/DKM

WBS DESCRIPTION	ESTIMATE	ESCALATION	TOTAL	SUB	CONTINGENCY	TOTAL	SUB	ALLOCATION	TOTAL
111000 DEFINITIVE DESIGN	3520503	0	3520503	0	3520503	10	3520503	3872553	5219040
SUBTOTAL 11 ENGINEERING	3520503	0	3520503	0	3520503	10	3520503	3872553	5219040
121000 ENGINEERING INSPECTION	2870565	2.29	65735	2936300	10	2936300	3229931	1123047	4352978
SUBTOTAL 1 ENGINEERING	6391068	1.03	65735	6456803	10	6456803	7102484	2469533	9572018
110000 HEALTH PHYSICS TECHNICIAN	1027270	2.29	23524	1050794	15	1576139	1208413	0	1208413
SUBTOTAL 310 HEALTH PHYSICS TECHNICIAN	1027270	2.29	23524	1050794	15	1576139	1208413	0	1208413
111000 NEW 8103 VALVE PIT	1093923	2.29	25050	1118974	15	1678466	1268820	328219	1615039
SUBTOTAL 311AN TOTAL AN TANK/FRM VALV PIT	1093923	2.29	25050	1118974	15	1678466	1268820	328219	1615039
111AP2 241-AP VALVE PIT MODIFICATIONS	369281	2.29	8456	377737	15	56660	434398	141996	576394
SUBTOTAL 311AP AP TANK/FRM PIT UPGRADES	369281	2.29	8456	377737	15	56660	434398	141996	576394
111AV2 AV-102 PUMP PIT MODIFICATIONS	612721	2.29	14031	626753	15	94012	720765	202847	923613
SUBTOTAL 311AV AV TANK/FRM PIT UPGRADES	612721	2.29	14031	626753	15	94012	720765	202847	923613
111AZ2 AZ-101 PUMP PIT MODIFICATIONS	1098564	2.29	25157	1123721	15	168558	13929451	341102	1370554
SUBTOTAL 311AZ AZ TANK/FRM PIT UPGRADES	1098564	2.29	25157	1123721	15	168558	13929451	341102	1370554
111AN1 CP SECTON OF X-SIZE TRNRS TO 103-AN	294952	2.29	6754	301707	15	45556	346963	112867	459830
111AN2 VALVE PIT #103 TO VALVE PIT AN-A	451437	2.29	10337	461775	15	69566	531042	1178851	700393
111AN4 VALV/PIT #103 TO GREEN FIELD BY-PASS	2953513	2.29	67635	3021149	15	453172	3474321	1127484	4601806

FLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. Z569 (ALT-3)
 FILE NO. Z5691AT3

** EST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-3)
 PHMCR02 - WORK BREAKDOWN STRUCTURE (WBS) SUMMARY

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 BY JFM/KLR/SMP/DKH

WBS DESCRIPTION	ESTIMATE	ESCALATION		SUB	CONTINGENCY		SUB	SITE	TOTAL
	SUBTOTAL	%	TOTAL	TOTAL	%	TOTAL	TOTAL	ALLOCAT'N	DOLLARS
312AN5 VLV/PIT AN-B TO PUMP PIT AZ-102	1467254	2.29	33600	1500854	15	225128	1725983	568513	2294496
SUBTOTAL 312AN TOTAL AN TNK/FRM TRNSP/PIPE	5552065	2.29	127142	5679207	15	851881	6531088	2128319	8659408
312AP1 AP-241-04D TIE IN	24583	2.29	562	25146	15	3772	28918	9658	38577
312AP2 241-AP PIT TO GRN/FLD PIPING	172810	2.29	3957	176768	15	26515	203283	65896	269180
SUBTOTAL 312AP TOTAL AN TNK/FRM TRNSP/PIPE	197394	2.29	4520	201914	15	30287	232202	75555	307757
312AY3 AY-101 PUMP PIT TO AY-102 PUMP PIT	1188850	2.29	27224	1216075	15	182411	1398486	432471	1830957
SUBTOTAL 312AY TOTAL AN TNK/FRM TRNSP/PIPE	1188850	2.29	27224	1216075	15	182411	1398486	432471	1830957
312AZ1 AZ-102 /TNK/FRM TO GRN/FLD BY-PASS	1000013	2.29	22900	1022914	15	153437	1176351	381613	1557964
312AZ2 AZ-102 PUMP PIT TO AY-102 PUMP PIT	1571736	2.29	35992	1607729	15	241159	1848889	599696	2448585
312AZ3 AZ-101 PUMP PIT TO AZ-102 PUMP PIT	2082608	2.29	47691	2130300	15	319545	2449845	771273	3221118
SUBTOTAL 312AZ TOTAL AN TNK/FRM TRNSP/PIPE	4654358	2.29	106584	4760943	15	714141	5475085	1752583	7227668
SUBTOTAL 31 TOTAL C/PORCES CONSTRUCTION	17038845	2.29	390189	17429034	15	2614355	20043390	5966112	26009503
321100 FP SECT'N /X-SITE TRANSP TO AN FARM	539327	2.29	12350	551677	30	165503	717180	152812	869993
321200 TANK FARM GRN/FLD BY-PASS AN TO AP	1767772	2.29	40481	1808254	30	542476	2350730	253418	2604149
SUBTOTAL 321 TOTAL X-SITE TRANSP & GRN/F	2307099	2.29	52832	2359931	30	707979	3067921	406231	3474142
SUBTOTAL 32 TOTAL FIXED PRICE CONSTRUCT	2307099	2.29	52832	2359931	30	707979	3067921	406231	3474142
SUBTOTAL 3 TOTAL CONSTRUCTION	19345944	2.29	443022	19788966	17	3322334	23111301	6372344	29483645
500000 OPC COST	8415943	1.34	112773	8528716	10	852871	9381588	0	9381588
SUBTOTAL 5 OTHER PROJECT COST	8415943	1.34	112773	8528716	10	852871	9381588	0	9381588
PROJECT TOTAL	34,152,955	1.82	621,531	34,774,487	14	4,820,886	39,595,373	8,841,878	48,437,252

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. Z569 (ALT-3)
FILE NO. Z5691AT3

** EST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER (AN-AZ-AY TO AD TANK FARM)
ORDER OF MAGNITUDE (ALT-3)
PHMCRO3 - ESTIMATE BASIS SHEET

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BY JPM/KLR/SMF/DKH

1.. ESTIMATE PURPOSE

ROUGH ORDER OF MAGNITUDE (STUDY) ESTIMATE: THIS ESTIMATE WILL BE USED AS A GUIDELINE TO ESTABLISH COST AND FEASIBILITY OF PROPOSED PROJECT.

2.. ESTIMATE TECHNICAL BASIS

- A. THIS ESTIMATE HAS BEEN PREPARED FOR THE NUMATEC HANFORD INC AS REQUESTED BY FDNW PROJECT MANAGEMENT
B. A DESCRIPTION OF THE TECHNICAL SCOPE OF WORK MAY BE FOUND IN THE FOLLOWING REFERENCE DOCUMENTS:
LOI #LNHC96HO-000 CO-96-THRS-170, DATED FEB. 20, 1998
STATEMENT OF WORK "FBSD DELIVERY ESTIMATE" DATED FEB. 25, 1998
PROVIDED PRELIMINARY SKETCHES IN ACCORDANCE WITH DRAWING LIST DATED MAR. 17, 1998
C. THIS ESTIMATE UTILIZES AN ESTIMATE WORK BREAKDOWN STRUCTURE. THE (MBS) IS USED TO DISTINGUISH BETWEEN PROJECT ACTIVITIES AND ALSO MAY BE USED AS A METHOD OF TRACKING PROJECT COSTS AND SCHEDULE.
D. THIS ESTIMATE ALSO UTILIZES A STANDARD FDNW DEFINED CODE OF ACCOUNTS.

3.. ESTIMATE METHODOLOGY

- A. DIRECT COSTS:
(1) A BOTTOMS-UP TECHNIQUE HAS BEEN UTILIZED IN THE PREPARATION OF THIS ESTIMATE.
CONSTRUCTION LABOR, MATERIAL AND EQUIPMENT UNITS HAVE BEEN ESTIMATED BASED UPON ONE OR MORE OF THE FOLLOWING STANDARD COMMERCIAL ESTIMATING RESOURCES, PUBLISHED ESTIMATING MANUALS/DATABASES: IN HOUSE DATABASES R.S. MEANS RICHARDSON'S PROCESS PLANT CONSTRUCTION ESTIMATING STANDARDS, NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION, INC. (NECA) MANUAL OF LABOR UNITS. ELECTRICAL RESOURCES, INC. ELECTRICAL ESTIMATING PRICE AND LABOR MANUAL THE UNITS MAY HAVE BEEN FACTORED/ADJUSTED BY THE ESTIMATOR AS APPROPRIATE TO REFLECT INFLUENCES BY CONTRACT, WORK SITE, OR OTHER IDENTIFIED PROJECT OR SPECIAL CONDITIONS.
B. DIRECT COST FACTORS:
(1) SALES TAX HAS BEEN APPLIED TO ALL MATERIALS AND EQUIPMENT PURCHASES AT 8%.
(2) SPECIAL WORK PROCEDURE (SWP) FACTORS ARE APPLIED AGAINST DIRECT LABOR FOR ACTUAL TIME LOST DUE TO THE PERSONNEL PROTECTIVE EQUIPMENT AND PROCEDURES. THE RATES WHICH HAVE BEEN APPLIED ARE AS FOLLOWS:
PROTECTIVE CLOTHING FACTOR HAS BEEN APPLIED - 40%
MASK WORK - 8% PLUS 15% FOR PROTECTIVE CLOTHING.
(3) GENERAL FOREMAN FACTOR OF 7% HAS BEEN APPLIED TO DIRECT CRAFT LABOR CREWS.
(4) ONSITE A/E CONSTRUCTION FORCES INCLUDE A 33% CONTRACT ADMINISTRATION FACTOR AND A 38% GENERAL REQUIREMENTS FACTOR. OFFSITE CONSTRUCTION FORCES INCLUDE A 19.90% CONTRACT ADMINISTRATION FACTOR. APPLIED FACTORS INCLUDE COSTS FOR BID PACKAGE PREPARATION, CONTRACT MANAGEMENT & ADMINISTRATION AND PROJECT MANAGEMENT & PLANNING.
(5) A FACTOR OF 1% HAS BEEN APPLIED TO DIRECT CRAFT LABOR TO ALLOW FOR USAGE OF GOVERNMENT OWNED EQUIPMENT CONTROLLED BY DYNACORP.

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. Z569 (ALT-3)
FILE NO. Z569ALT3

** IEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XPER (AR-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-3)
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C. INDIRECT COSTS:

FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS HAVE BEEN APPLIED ARE THE FOLLOWING PERCENTAGES:
LABOR 25%, EQUIPMENT USE = 0%, MATERIAL =25%, SUBCONTRACT -10%, AND EQUIPMENT = 0% , AND ARE REFLECTED IN THE
"OH&P/6&1" COLUMN OF THE ESTIMATE DETAIL REPORT.

D. RATES:

- (1) FOR ESTIMATING PURPOSES, AVERAGE FDNM RATES BY OPERATION CODE HAVE BEEN DEVELOPED BASED UPON RECENT COST HISTORY AND ADJUSTED TO REFLECT INDUSTRY AVERAGE AS/CH RATES.
- (2) FLUOR DANIEL NORTHWEST SERVICES (CONSTRUCTION CRAFT LABOR) RATES ARE THOSE LISTED IN APPENDIX A TO THE HANFORD SITE STABILIZATION AGREEMENT (HSSA). THE HSSA RATES INCLUDE BASE WAGE, FRINGE BENEFITS AND OTHER COMPENSATION AS NEGOTIATED BETWEEN FLUOR DANIEL HANFORD, INC. AND THE NATIONAL BUILDING AND CONSTRUCTION TRADES DEPARTMENT AFL-CIO. FLUOR DANIEL NORTHWEST COST ESTIMATING INCORPORATES FACTORS TO COVER ADDITIONAL COSTS FOR WORKMEN COMPENSATION, FICA, STATE AND FEDERAL UNEMPLOYMENT INSURANCE AND G&A/FEE TO DEVELOP A FULLY BURDENED RATE BY CRAFT.

E. SITE ALLOCATIONS FACTORS:

SITE ALLOCATION FACTORS ARE DEVELOPED AND PROVIDED BY FLUOR DANIEL HANFORD (FDH) FOR ESTIMATING USE.

- (1) GOVERNMENT FURNISHED SERVICES RATE IS APPLIED TO ALL COSTS TO LIQUIDATE GOVERNMENT FURNISHED SERVICES PROVIDED THE ENTERPRISE COMPANIES, 7% FOR FDNM AND PDNMS (CONSTRUCTION)
- (2) HANFORD SITE G&A AND ESS FOR FY98 (18%) FY 99 (15%), FY 00 (22%) WERE APPLIED TO ALL COSTS TO LIQUIDATE THE HANFORD GENERAL & ADMINISTRATIVE COSTS AND ESSENTIAL SITE SERVICES (I.E. FIRE, WATER ELECTRICAL, ETC.)

FDNM APPLIED THE ABOVE FACTORS TO ESTIMATED COSTS AS FOLLOWS:

- (1) FDH GFS/G&A - LABOR FACTOR: A COMPOSITE FACTOR BASED UPON FY 98 THRU FY 00 RATES HAVE BEEN APPLIED TO TOTAL FDNM LABOR COST AS FOLLOWS:
A/E (TITLE "I" ONLY) COSTS - 34.52, AS/CH COSTS - 26.26%, PDNMS CONSTRUCTION LABOR - 26.66%.
- (2) PDH MPR/G&A MATERIAL FACTOR: A COMPOSITE FACTOR OF 25.83% BASED UPON FY 98 THRU FY 00 RATES HAS BEEN APPLIED TO PDNM CONSTRUCTION MATERIAL. FDNM PROCUREMENTS A COMPOSITE FACTOR OF 24.98% HAS BEEN APPLIED BASED UPON FY 98 AND FY99 RATES.

4. ESCALATION

VERBAL SCHEDULE PROVIDED

5. CONTINGENCY

A. DEFINITION OF CONTINGENCY AS PROVIDED BY DOE

CONTINGENCY COVERS COSTS THAT MAY RESULT FROM INCOMPLETE DESIGN, UNFORSEEN AND UNPREDICTABLE CONDITIONS, OR UNCERTAINTIES WITHIN THE DEFINED PROJECT SCOPE. THE AMOUNT OF CONTINGENCY WILL DEPEND ON THE STATUS OF DESIGN, PROCUREMENT, AND CONSTRUCTION; AND THE COMPLEXITY AND UNCERTAINTIES OF THE COMPONENT PARTS OF THE PROJECT. CONTINGENCY IS NOT TO BE USED TO AVOID MAKING AN ACCURATE ASSESSMENT OF EXPECTED COST (OFFICE OF WASTE MANAGEMENT (EM-30) COST AND SCHEDULE GUIDE.

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. 2569 (ALT-3)
FILE NO. 25691AT3

** TEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XPER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-3)
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B. CONTINGENCY ALLOWANCE GUIDELINES

THE DOE GUIDELINE (REF. 5700.3) CONTINGENCY ALLOWANCE FOR A STUDY ESTIMATE (STANDARD 20%-30%) (EXPERIMENTAL 30%-50%)

C. METHODOLOGY

CONTINGENCY IS EVALUATED AT THE LOWEST WORK BREAKDOWN STRUCTURE (WBS) LEVEL WITHIN THE COST ESTIMATE DETAILS. IT IS SUMMARIZED AT UPPER WBS LEVELS AND REPORTED ON THE SUMMARY REPORTS.

D. ANALYSIS

AN ASSESSMENT OF DESIGN MATURITY, WORK COMPLEXITY AND PROJECT UNCERTAINTIES HAS BEEN PERFORMED. AN EXPLANATION OF THIS ASSESSMENT AND CONTINGENCY RATES WHICH HAVE BEEN ADDED TO THE COST OF WORK ARE AS FOLLOWS:

ENGINEERING:

N/A (ESTIMATE ISSUED FOR CONSTRUCTION EVALUATION ONLY).

ENGINEERING:

WBS 11/12/50

AN AVERAGE CONTINGENCY OF 10% WAS APPLIED TO ENGINEERING AND OPERATING CONTRACTOR COSTS DUE TO THE PERCENTAGE METHOD USED TO ATTAIN COSTS.

CONSTRUCTION:

WBS 311AP

AN AVERAGE 15% CONTINGENCY IS APPLIED TO 241-AP VALVE PIT MODIFICATIONS DUE TO UNKNOWN PIT CONTAMINATION AND WHAT TYPE OF RADIATION IS PRESENT; AN ALLOWANCE FOR PIT DECONTAMINATION HAS BEEN ESTIMATED AND FINAL THE STUDY ON HOW THE PITS CAN BE DECON IS FORTH COMING. NO DETERMINATION HAS BEEN MADE AS TO THE DISPOSAL REQUIREMENTS. ALSO RADIATION LEVEL HAS NOT BEEN ESTABLISHED; THEREFORE TYPE OF SWP COSTS MAY HAVE TO BE ADJUSTED AND SOME FUNDING FOR BURNOUT MAY BE REQUIRED.

WBS 311AY

AN AVERAGE 15% CONTINGENCY IS APPLIED TO AY TANK FARM PUMP PIT MODIFICATIONS DUE TO UNKNOWN CONTAMINATION ELEVATIONS AND POSSIBLE SCHEDULING PROBLEMS DURING RETROFIT OF PIT JUMPERS. IF CONTAMINATION LEVELS ARE HIGHER THAN ANTICIPATED COST FOR RADIATION CONTAINMENT, SUCH AS, GREEN HOUSE, STEP OFF PAD, AND HEPA FILTRATION SYSTEMS WILL INCREASE COSTS, IF WORK CREWS ARE UNABLE TO MAKE JUMPER CHANGE-OUTS DURING REGULAR WORKING HOURS AND HAVE TO COMPLETE JUMPER INSTALLATION DURING PREMIUM TIME, LABOR COSTS WILL INCREASE SIGNIFICANTLY.

WBS 311AZ

AN AVERAGE 15% CONTINGENCY IS APPLIED TO AZ TANK FARM PUMP PIT MODIFICATIONS BECAUSE ADDITIONAL PIPING FLUSHING NECESSARY TO REDUCE RADIATION LEVEL IN ORDER TO REMOVE JUMPERS. ADDITIONAL FLUSHING WILL ADD TO CRAFT DOWN TIME WHILE WAITING FOR TESTING AND COMPLETION OF FLUSHING OPERATIONS.

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. Z569 (ALT-3)
FILE NO. Z5691AT3

** IEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XPER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-3)
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WBS 312AN, AY, AZ

AN AVERAGE OF 15% CONTINGENCY IS APPLIED TO PIPELINE WORK DUE TO THE UNDERGROUND OBSTRUCTION THAT MAY CAUSE GRADE CHANGES, ROUTING CHANGES AND WORK METHOD DUE TO THE CONTAMINATION PRESENT DURING EXCAVATION. TESTING METHODS MAY BE CHANGED UPON OPERATIONS FINAL APPROVAL OF LEAVING COVER BLOCKS OFF FOR DURATION OF CONSTRUCTION. A UNDERGROUND SCAN HAS BEEN DONE DUE EXACT DEPTH AND OBJECT IDENTIFICATION IS NO CLEAR. DUE TO THESE UNCERTAINTIES MORE SAFETY PRECAUTIONS MAY BE NEEDED UNTIL DISCOVER OF THESE UNKNOWNNS ARE UNCOVERED. ALSO FLUCTUATIONS IS COSTS WILL NECESSITATE ADDITIONAL CONSTRUCTION SUPPORT COSTS.

WBS 32

AN AVERAGE OF 30% CONTINGENCY IS APPLIED TO "GREEN FIELD CONSTRUCTION" DUE TO UNKNOWN OBSTRUCTION BOTH BELOW AND ABOVE GROUND THAT WILL HAVE TO BE RELOCATED OR PIPELINE ROUTING WILL HAVE TO BE CHANGED. NEW PIPELINE BERMS MAY GO OVER EXISTING, DRAIN, LINES, DRAIN FIELDS, PROCESS AND RAW WATER LINE VALVE PITS. IF THIS OCCURS EXISTING LINES WILL HAVE TO BE RELOCATED OR NEW PIPING WILL BE REROUTED IN EITHER CASE ADDITIONAL COSTS WILL BE NEEDED TO FUND SUCH OPERATIONS.

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. 2569 (ALT-3)
FILE NO. 25691AT3

** IBST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XPER (AN-AZ-AY TO AP TANK FARM)
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7. REMARKS

MAJOR ASSUMPTIONS WHICH HAVE BEEN MADE IN THE PREPARATION OF THIS ESTIMATE ARE AS FOLLOWS:

EXCAVATION ASSUMPTIONS:

- A.) ALL TRENCH EXCAVATIONS INSIDE FARM AREA ESTIMATED TO BE COMPLETED BY HAND.
- B.) ASSUME MACHINE ASSISTANCE ON TRENCH BACKFILL. THIS INCLUDES DUMP TRUCK & LOADER
- C.) ASSUME ALL FILL FOR SHIELDING BERM WILL BE AVAILABLE IN TANK FARM.
- D.) ASSUME ALL CDF CAN BE PLACED IN FOUR DAYS. NOBE/DEMOBE WAS ESTIMATED FOR FOUR DIFFERENT DAYS.
- E.) ESTIMATE INCLUDES NINE POTHOLE LOCATIONS AS MARKED ON DWGS BY CONSTRUCTION MANAGER. THESE POTHOLE ARE ONLY FOR GRADE MARKS.
- F.) THE POTHOLE ARE FIGURED USING THE GUZZLER TO SEE EFFECTIVENESS OF MACHINE.
- F.) SHIELDING BERM FIGURED TO HAVE A FOUR FOOT FLAT TOP WITH 2 TO 1 SLOPES.

PIPELINE (MECHANICAL) ASSUMPTIONS:

- A.) ASSUME ESTIMATE DOES NOT REQUIRE DRAIN FROM AZ PIT.
- E.) ASSUME DEMO'D MATERIALS WILL BE BURIED AS LLW.
- C.) APPLIED AY PIT MODIFICATION AMOUNT TO AP PIT MODIFICATIONS. NO DIRECTION OR DETAIL WERE PROVIDED.
- D.) ASSUME EXCAVATION MATERIALS TO BE HANDLED DURING GREEN FIELD PORTION OF PROJECT WILL BE FREE FROM ANY CONTAMINATION RADIATION OR OTHERWISE.
- E.) ASSUME PIPING CONNECTION TO AN TANK FARM PITS A & B WILL BE OUTSIDE OF PIT. FUNDING FOR REMOVAL & REPLACEMENT OF COVER BLOCKS IN NOT IN ESTIMATE. ALSO RETROFITTING OF JUMPERS IS NOT IN ESTIMATE.
- F.) ASSUME PROCEDURES WILL ALLOW SENSITIVE LEAK TEST OF PIPING AT W-058 CROSS SITE TRANSFER.
- G.) ASSUME LIQW-720 MODIFICATIONS WILL NOT BE ADDRESSED BY THIS PROJECT.
- H.) ASSUME REVISIONS TO CANTON AVE WILL NOT BE REQUIRED.
- I.) ASSUME MASTER PUMP SHUTDOWN COSTS WILL BE PROVIDED BY ANOTHER PROJECT, FUNDING IS NOT IN THIS ESTIMATE.

ELECTRICAL & INSTRUMENTATION:

- A.) ELECTRICAL WORK PERFORMED OUTSIDE OF THE TANK FARM, WITH NO SWP FACTOR APPLIED INCLUDES: TERMINAL BOXES CONTROL ENCLOSURES, INSTALLING CONDUITS/FITTINGS, SIZES AND CABLES.
- B.) CATHODIC PROTECTION WILL BE PLACED WHEN THE TRENCH WALLS ARE SHORED.
- C.) ANODE HEADER AND LOOP WILL BE IN THE SAME TRENCH AS PIPE IS RUN.

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FLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. 2569 (ALT-3)
 FILE NO. Z5691AT3

** IEST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-3)
 PHMCR04 - COMPANY/WBS SUMMARY

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 BY JPN/KLR/SMP/DKH

SORT CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	SUB TOTAL	SITE ALLOCAT'N	TOTAL DOLLARS
FDH	FLUOR DANIEL HANFORD, INC.							
310000	HEALTH PHYSICS TECHNICIAN	1027270	2.29	23524	1050794	15	157619	1208413
	SUBTOTAL 310 HEALTH PHYSICS TECHNICI	1027270	2.29	23524	1050794	15	157619	1208413
	SUBTOTAL 31 TOTAL C/FORCES CONSTRUC	1027270	2.29	23524	1050794	15	157619	1208413
	SUBTOTAL 3 TOTAL CONSTRUCTION	1027270	2.29	23524	1050794	15	157619	1208413
	TOTAL FDH FLUOR DANIEL HANFORD, INC.	1027270	2.29	23524	1050794	15	157619	1208413
FDNW	FLUOR DANIEL NORTHWEST							
111000	DEFINITIVE DESIGN	3520503	0.00	0	3520503	10	352050	3872553
	SUBTOTAL 11 ENGINEERING	3520503	0.00	0	3520503	10	352050	3872553
121000	ENGINEERING INSPECTON	2870565	2.29	65735	2936300	10	293630	3229931
	SUBTOTAL 1 ENGINEERING	6391068	1.03	65735	6456803	10	645680	7102484
311AN1	NEW #103 VALVE PIT	1093923	2.29	25050	1118974	15	167846	1286820
	SUBTOTAL 311AN TOTAL AN TNK/FRM VLV PI	1093923	2.29	25050	1118974	15	167846	1286820
311AP2	241-AP VALVE PIT MODIFICATIONS	369281	2.29	8456	377737	15	56660	434398
	SUBTOTAL 311AP AP TNK/FRM PIT UPGRADES	369281	2.29	8456	377737	15	56660	434398
311AY1	AY-101 PUMP PIT MODIFICATONS	369281	2.29	8456	377737	15	56660	434398
311AY2	AY-102 PUMP PIT MODIFICATONS	612721	2.29	14031	626753	15	94012	720765
	SUBTOTAL 311AY AY TNK/FRM PIT UPGRADES	982002	2.29	22487	1004490	15	150673	1155164
311AZ1	AZ-101 PUMP PIT MODIFICATIONS	1098564	2.29	25157	1123721	15	168558	1292279

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FLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. Z569 (ALT-7)
 FILE NO. Z5691AT7

** TEST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-7)
 PHNCR01 - PROJECT COST SUMMARY

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 BY JPN/KLR/SWF/DKH

SORT	DESCRIPTION	ESCALATED TOTAL COST	CONTINGENCY		TOTAL DOLLARS
			%	TOTAL	
FDH	FLUOR DANIEL HANFORD, 'INC.	820,000	15	120,000	940,000
FDNW	FLUOR DANIEL NORTHWEST	20,390,000	16	3,280,000	23,670,000
LHMC	LOCKHEED MARTIN HANFORD COMPANY	7,000,000	10	700,000	7,700,000
=====					
	SUBTOTAL	28,210,000	15	4,100,000	32,310,000
=====					
SITE	SITE ALLOCATIONS	5,980,000	14	860,000	6,840,000
	(ADJUSTED TO MEET DOE 5100.4)	10,000		40,000	50,000
=====					
	PROJECT TOTAL	34,200,000	15	5,000,000	39,200,000

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TYPE OF ESTIMATE	ROUGH ORDER OF MAGNITUDE	REMARKS:
FDNW LEAD ESTIMATOR	J. MOKLER	ALT # 7 =====
ESTIMATING MANAGER	G. CHADWICK	
PROJECT MANAGER	J. CUNNINGHAM	
CLIENT	NUMATEC	

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

FLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. 2569 (ALT-7)
 FILE NO. 25691AT7

** TEST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-7)
 PHNCR02 - WORK BREAKDOWN STRUCTURE (MBS) SUMMARY

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 BY JPN/KLR/SMF/DKH

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	SUB TOTAL	SITE ALLOCAT'N	TOTAL DOLLARS		
111000	DEFINITIVE DESIGN	2754000	0.00	0	2754000	10	275400	3029400	1053322	4082722
	SUBTOTAL 11 ENGINEERING	2754000	0.00	0	2754000	10	275400	3029400	1053322	4082722
121000	ENGINEERING INSPECTION	2349000	2.29	53792	2402792	10	240279	2643071	918995	3562067
	SUBTOTAL 1 ENGINEERING	5103000	1.05	53792	5156792	10	515679	5672471	1972318	7644789
310000	HEALTH PHYSICS TECHNICIAN	800315	2.29	18327	818642	15	122796	941438	0	941438
311AP2	241-AP VALVE PIT MODIFICATIONS	369281	2.29	8456	377737	15	56660	434398	141996	576394
	SUBTOTAL 311AP AP. TNK/FRM PIT UPGRADES	369281	2.29	8456	377737	15	56660	434398	141996	576394
311AY1	AY-101 PUMP PIT MODIFICATONS	369281	2.29	8456	377737	15	56660	434398	141996	576394
311AY2	AY-102 PUMP PIT MODIFICATONS	612721	2.29	14031	626753	15	94012	720765	202847	923613
	SUBTOTAL 311AY AY TNK/FRM PIT UPGRADES	982002	2.29	22487	1004490	15	150673	1155164	344843	1500008
311AZ1	AZ-101 PUMP PIT MODIFICATIONS	1098564	2.29	25157	1123721	15	168558	1292279	421021	1713300
311AZ2	AZ-102 PUMP PIT MODIFICATIONS	875134	2.29	20040	895175	15	134276	1029451	341102	1370554
	SUBTOTAL 311AZ AZ TNK/FRM PIT UPGRADES	1973698	2.29	45197	2018896	15	302834	2321730	762124	3083854
312AN1	TANK AN-101 TO GRN/FLD BY - PASS	453422	2.29	10383	463805	15	69570	533376	173643	707019
312AN2	TANK AN-104 TO GRN/FLD BY - PASS	451437	2.29	10337	461775	15	69266	531042	172851	703893
312AN5	VLV/PIT AN-B TO PUMP PIT AZ-102	1467254	2.29	33600	1500854	15	225128	1725983	568513	2294496
	SUBTOTAL 312AN TOTAL AN TNK/FRM TRNSF/PIPE	2372114	2.29	54321	2426436	15	363965	2790401	915008	3705409
312AP1	AP-241-04D TIE IN	24583	2.29	562	25146	15	3772	28918	9658	38577
312AP2	241-AP PIT TO GRN/FLD PIPING	172810	2.29	3957	176768	15	26515	203283	65896	269180
	SUBTOTAL 312AP TOTAL AN TNK/FRM TRNSF/PIPE	197394	2.29	4520	201914	15	30287	232202	75555	307757
312AY3	AY-101 PUMP PIT TO AY-102 PUMP PIT	1188850	2.29	27224	1216075	15	182411	1398486	429035	1827521
	SUBTOTAL 312AY TOTAL AN TNK/FRM TRNSF/PIPE	1188850	2.29	27224	1216075	15	182411	1398486	429035	1827521

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FLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. 2569 (ALT-7)
 FILE NO. 25691AT7

**** TEST - INTERACTIVE ESTIMATING ****
 MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-7)
 PHMCRO2 - WORK BREAKDOWN STRUCTURE (WBS) SUMMARY

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 BY JPM/KLR/SWF/DKH

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ESCALATION % TOTAL	SUB TOTAL	CONTINGENCY % TOTAL	SUB TOTAL	SITE ALLOCAT'N	TOTAL DOLLARS		
312AZ1	AZ-102 /TNK/FRM TO GRN/FLD BY-PASS	1003242	2.29	22974	1026217	15	153932	1180149	380011	1560161
312AZ2	AZ-102 PUMP PIT TO AY-102 PUMP PIT	1571736	2.29	35992	1607729	15	241159	1848889	599696	2448585
312AZ3	AZ-101 PUMP PIT TO AZ-102 PUMP PIT	2082608	2.29	47691	2130300	15	319545	2449845	771273	3221118
	SUBTOTAL 312AZ TOTAL AN TNK/FRM TRNSF/PIPE	4657588	2.29	106658	4764246	15	714637	5478883	1750981	7229865
	SUBTOTAL 31 TOTAL C/FORCES CONSTRUCTION	12541245	2.29	287194	12828440	15	1924266	14752706	4419544	19172250
321170	FP SECT'N /X-SITE TRANSF TO AN FARM	555798	2.29	12727	568526	30	170558	739084	79676	818761
321270	TANK FARM GRN/FLD BY-PASS AN TO AP	2594321	2.29	59409	2653731	30	796119	3449851	371908	3821760
	SUBTOTAL 321 TOTAL X-SITE TRANSF & GRN/F	3150120	2.29	72137	3222258	30	966677	4188936	451585	4640521
	SUBTOTAL 32 TOTAL FIXED PRICE CONSTRUCT	3150120	2.29	72137	3222258	30	966677	4188936	451585	4640521
	SUBTOTAL 3 TOTAL CONSTRUCTION	15691366	2.29	359332	16050698	18	2890943	18941642	4871130	23812772
500000	OPC COSTS	6908982	1.34	92580	7001562	10	700156	7701718	0	7701718
	SUBTOTAL 5 OTHER PROJECT COST	6908982	1.34	92580	7001562	10	700156	7701718	0	7701718
PROJECT TOTAL		27,703,348	1.83	505,704	28,209,053	15	4,106,779	32,315,832	6,843,448	39,159,280

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 Revision 0

FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. 2569 (ALT-7)
FILE NO. 25691A17

** TEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-7)
PHNCROS - ESTIMATE BASIS SHEET

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1.. ESTIMATE PURPOSE

ROUGH ORDER OF MAGNITUDE (STUDY) ESTIMATE: THIS ESTIMATE WILL BE USED AS A GUIDELINE TO ESTABLISH COST AND FEASIBILITY OF PROPOSED PROJECT.

2.. ESTIMATE TECHNICAL BASIS

- A. THIS ESTIMATE HAS BEEN PREPARED FOR THE NUMATEC HANFORD INC AS REQUESTED BY FDNW PROJECT MANAGEMENT
B. A DESCRIPTION OF THE TECHNICAL SCOPE OF WORK MAY BE FOUND IN THE FOLLOWING REFERENCE DOCUMENTS:
LO1 #LMHC96W0-000 CO-96-TWRS-170, DATED FEB. 20, 1998
STATEMENT OF WORK "FEED DELIVERY ESTIMATE" DATED FEB. 25, 1998
PROVIDED PRELIMINARY SKETCHES IN ACCORDANCE WITH DRAWING LIST DATED MAR. 17, 1998
C. THIS ESTIMATE UTILIZES AN ESTIMATE WORK BREAKDOWN STRUCTURE. THE (WBS) IS USED TO DISTINGUISH BETWEEN PROJECT ACTIVITIES AND ALSO MAY BE USED AS A METHOD OF TRACKING PROJECT COSTS AND SCHEDULE.
D. THIS ESTIMATE ALSO UTILIZES A STANDARD FDNW DEFINED CODE OF ACCOUNTS.

3.. ESTIMATE METHODOLOGY

A. DIRECT COSTS:

- (1) A BOTTOMS-UP TECHNIQUE HAS BEEN UTILIZED IN THE PREPARATION OF THIS ESTIMATE.
CONSTRUCTION LABOR, MATERIAL AND EQUIPMENT UNITS HAVE BEEN ESTIMATED BASED UPON ONE OR MORE OF THE FOLLOWING STANDARD COMMERCIAL ESTIMATING RESOURCES, PUBLISHED ESTIMATING MANUALS/DATABASES: IN HOUSE DATABASES R.S. MEANS RICHARDSON'S PROCESS PLANT CONSTRUCTION ESTIMATING STANDARDS, NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION, INC. (NECA) MANUAL OF LABOR UNITS. ELECTRICAL RESOURCES, INC. ELECTRICAL ESTIMATING PRICE AND LABOR MANUAL THE UNITS MAY HAVE BEEN FACTORED/ADJUSTED BY THE ESTIMATOR AS APPROPRIATE TO REFLECT INFLUENCES BY CONTRACT, WORK SITE, OR OTHER IDENTIFIED PROJECT OR SPECIAL CONDITIONS.

B. DIRECT COST FACTORS:

- (1) SALES TAX HAS BEEN APPLIED TO ALL MATERIALS AND EQUIPMENT PURCHASES AT 8%.
(2) SPECIAL WORK PROCEDURE (SWP) FACTORS ARE APPLIED AGAINST DIRECT LABOR FOR ACTUAL TIME LOST DUE TO THE PERSONNEL PROTECTIVE EQUIPMENT AND PROCEDURES. THE RATES WHICH HAVE BEEN APPLIED ARE AS FOLLOWS:
PROTECTIVE CLOTHING FACTOR HAS BEEN APPLIED = 40%
MASK WORK = 85% PLUS 15% FOR PROTECTIVE CLOTHING.

- (4) GENERAL FOREMAN FACTOR OF 7% HAS BEEN APPLIED TO DIRECT CRAFT LABOR CREWS.
(5) ONSITE A/E CONSTRUCTION FORCES INCLUDE A 33% CONTRACT ADMINISTRATION FACTOR AND A 38% GENERAL REQUIREMENTS FACTOR, OFFSITE CONSTRUCTION FORCES INCLUDE A 19.90% CONTRACT ADMINISTRATION FACTOR. APPLIED FACTORS INCLUDE COSTS FOR BID PACKAGE PREPARATION, CONTRACT MANAGEMENT & ADMINISTRATION AND PROJECT MANAGEMENT & PLANNING.
(6) A FACTOR OF 10% HAS BEEN APPLIED TO DIRECT CRAFT LABOR TO ALLOW FOR USAGE OF GOVERNMENT OWNED EQUIPMENT CONTROLLED BY DYNACORP.

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FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. Z569 (ALT-7)
FILE NO. Z5691A17

** EST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-7)
PHMCRO3 - ESTIMATE BASIS SHEET

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C. INDIRECT COSTS:

FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS HAVE BEEN APPLIED ARE THE FOLLOWING PERCENTAGES:
LABOR 25%, EQUIPMENT USE = 0%, MATERIAL =25%, SUBCONTRACT =10%, AND EQUIPMENT = 0% , AND ARE REFLECTED IN THE
"DB&P/BI" COLUMN OF THE ESTIMATE DETAIL REPORT.

D. RATES:

- (1) FOR ESTIMATING PURPOSES, AVERAGE FDNW RATES BY OPERATION CODE HAVE BEEN DEVELOPED BASED UPON RECENT COST HISTORY AND ADJUSTED TO REFLECT INDUSTRY AVERAGE AE/CM RATES.
- (2) FLUOR DANIEL NORTHWEST SERVICES (CONSTRUCTION CRAFT LABOR) RATES ARE THOSE LISTED IN APPENDIX A TO THE HANFORD SITE STABILIZATION AGREEMENT (HSSA). THE HSSA RATES INCLUDE BASE WAGE, FRINGE BENEFITS AND OTHER COMPENSATION AS NEGOTIATED BETWEEN FLUOR DANIEL HANFORD, INC. AND THE NATIONAL BUILDING AND CONSTRUCTION TRADES DEPARTMENT AFL-CIO. FLUOR DANIEL NORTHWEST COST ESTIMATING INCORPORATES FACTORS TO COVER ADDITIONAL COSTS FOR WORKMEN COMPENSATION, FICA, STATE AND FEDERAL UNEMPLOYMENT INSURANCE AND G&A/FEE TO DEVELOP A FULLY BURDENED RATE BY CRAFT.

E. SITE ALLOCATIONS FACTORS:

- SITE ALLOCATION FACTORS ARE DEVELOPED AND PROVIDED BY FLUOR DANIEL HANFORD (FDH) FOR ESTIMATING USE.
- (1) GOVERNMENT FURNISHED SERVICES RATE IS APPLIED TO ALL COSTS TO LIQUIDATE GOVERNMENT FURNISHED SERVICES PROVIDED THE ENTERPRISE COMPANIES, 7% FOR FDNW AND FDNWS (CONSTRUCTION)
 - (2) HANFORD SITE G&A AND ESS FOR FY98 (18%) FY 99 (15%), FY 00 (22%) WERE APPLIED TO ALL COSTS TO LIQUIDATE THE HANFORD GENERAL & ADMINISTRATIVE COSTS AND ESSENTIAL SITE SERVICES (I.E. FIRE, WATER ELECTRICAL, ETC.)

FDNW APPLIED THE ABOVE FACTORS TO ESTIMATED COSTS AS FOLLOWS:

- (1) FDN GFS/G&A - LABOR FACTOR: A COMPOSITE FACTOR BASED UPON FY 98 THRU FY 00 RATES HAVE BEEN APPLIED TO TOTAL FDNW LABOR COST AS FOLLOWS:
A/E (TITLE II ONLY) COSTS = 34.52, AE/CM COSTS = 26.26%, FDNWS CONSTRUCTION LABOR = 26.66%.
- (2) FDN NPR/G&A MATERIAL FACTOR: A COMPOSITE FACTOR OF 25.83% BASED UPON FY 98 THRU FY 00 RATES HAS BEEN APPLIED TO FDNW CONSTRUCTION MATERIAL. FDNW PROCUREMENTS A COMPOSITE FACTOR OF 24.98% HAS BEEN APPLIED BASED UPON FY 98 AND FY99 RATES.

4. ESCALATION

N/A-(NO SCHEDULE PROVIDED)

5. CONTINGENCY

A. DEFINITION OF CONTINGENCY AS PROVIDED BY DOE

"CONTINGENCY COVERS COSTS THAT MAY RESULT FROM INCOMPLETE DESIGN, UNFORESEEN AND UNPREDICTABLE CONDITIONS, OR UNCERTAINTIES WITHIN THE DEFINED PROJECT SCOPE. THE AMOUNT OF CONTINGENCY WILL DEPEND ON THE STATUS OF DESIGN, PROCUREMENT, AND CONSTRUCTION; AND THE COMPLEXITY AND UNCERTAINTIES OF THE COMPONENT PARTS OF THE PROJECT. CONTINGENCY IS NOT TO BE USED TO AVOID MAKING AN ACCURATE ASSESSMENT OF EXPECTED COST" (OFFICE OF WASTE MANAGEMENT (EM-30) COST AND SCHEDULE GUIDE.

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** TEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE MEET (M-A-1 TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-7)
PHNCR03 - ESTIMATE BASIS SHEET

FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. 2569 (ALT-7)

FILE NO. 2569ALT7

- B. CONTINGENCY ALLOWANCE GUIDELINES
THE DOE GUIDELINE (REF. 5700.3) CONTINGENCY ALLOWANCE FOR A STUDY ESTIMATE (STANDARD 20X-30X) (EXPERIMENTAL 30X-50X) SUMMARIZED AT UPPER WBS LEVELS AND REPORTED ON THE SUMMARY REPORTS.
- C. METHODOLOGY
AN ASSESSMENT OF DESIGN MATURITY, WORK COMPLEXITY AND PROJECT UNCERTAINTIES HAS BEEN PERFORMED. AN EXPLANATION OF THIS ASSESSMENT AND CONTINGENCY RATES WHICH HAVE BEEN ADDED TO THE COST OF WORK ARE AS FOLLOWS:
- D. ANALYSIS

ENGINEERING:
WBS 11/12/50
AN AVERAGE CONTINGENCY OF 10X WAS APPLIED TO ENGINEERING AND OPERATION CONTRACTOR COSTS DUE TO THE PERCENTAGE METHOD USED TO AVOID COSTS.
CONSTRUCTION:
WBS 311AP
AN AVERAGE 15X CONTINGENCY IS APPLIED TO 241-AP VALVE PIT MODIFICATIONS DUE TO UNKNOWN PIT CONTAMINATION AND WHAT TYPE OF RADIATION IS PRESENT. AN ALLOWANCE FOR PIT DECONTAMINATION PIT HAS BEEN ESTIMATED AND FINAL THE STUDY ON HOW THE PITS CAN BE ESTABLISHED; THEREFORE TYPE OF SMP COSTS MAY HAVE TO BE ADJUSTED AND SOME FUNDING FOR BURNOUT MAY BE REQUIRED.

WBS 311AY
AN AVERAGE 15X CONTINGENCY IS APPLIED TO AT TANK FARM PUMP PIT MODIFICATIONS DUE TO UNKNOWN CONTAMINATION ELEVATIONS AND POSSIBLE SCHEDULING PROBLEMS DURING RETROFIT OF PIT JUMPERS. IF CONTAMINATION LEVELS ARE HIGHER THAN ANTICIPATED COST FOR RADIATION CONTAINMENT, SUCH AS, GREEN HOUSE, STEP OFF PAD, AND HEPA FILTRATION SYSTEMS WILL INCREASE COSTS. IF WORK CREWS ARE UNABLE TO MAKE JUMPER CHANGE-OUTS DURING REGULAR WORKING HOURS AND HAVE TO COMPLETE JUMPER INSTALLATION DURING PREMIUM TIME, LABOR COSTS WILL INCREASE SIGNIFICANTLY.

AN AVERAGE 15X CONTINGENCY IS APPLIED TO A2 TANK FARM PUMP PIT MODIFICATIONS BECAUSE ADDITIONAL PIPING FLUSHING NECESSARY TESTING AND COMPLETION OF FLUSHING OPERATIONS.

FLUOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. 2569 (ALT-7)
FILE NO. 25691AT-7

** TEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-7)
PHMCRO3 - ESTIMATE BASIS SHEET

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BY JPH/KLR/SNF/DKH

WBS 312AN, AY, AZ

AN AVERAGE OF 15% CONTINGENCY IS APPLIED TO PIPELINE WORK DUE TO THE UNDERGROUND OBSTRUCTION THAT MAY CAUSE GRADE CHANGES, ROUTING CHANGES AND WORK METHOD DUE TO THE CONTAMINATION PRESENT DURING EXCAVATION. TESTING METHODS MAY BE CHANGED UPON OPERATIONS FINAL APPROVAL OF LEAVING COVER BLOCKS OFF FOR DURATION OF CONSTRUCTION. A UNDERGROUND SCAN HAS BEEN DONE DUE EXACT DEPTH AND OBJECT INDEMNIFICATION IS NO CLEAR. DUE TO THESE UNCERTAINTIES MORE SAFETY PRECAUTIONS MAY BE NEEDED UNTIL DISCOVER OF THESE UNKNOWN ARE UNCOVERED. ALSO FLUCTUATIONS IS COSTS WILL NECESSITATE ADDITIONAL CONSTRUCTION SUPPORT COSTS.

WBS 32

AN AVERAGE OF 30% CONTINGENCY IS APPLIED TO "GREEN FIELD CONSTRUCTION" DUE TO UNKNOWN OBSTRUCTION BOTH BELOW AND ABOVE GROUND THAT WILL HAVE TO BE RELOCATED OR PIPELINE ROUTING WILL HAVE TO BE CHANGED. NEW PIPELINE BERMS MAY GO OVER EXISTING, DRAIN, LINES, DRAIN FIELDS, PROCESS AND RAW WATER LINE VALVE PITS. IF THIS OCCURS EXISTING LINES WILL HAVE TO BE RELOCATED OR NEW PIPING WILL BE REROUTED IN EITHER CASE ADDITIONAL COSTS WILL BE NEEDED TO FUND SUCH OPERATIONS.

6. ROUNDING

N/A ((CONSTRUCTION ONLY))

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FLOOR DANIEL NORTHWEST, INC.
LOCKHEED MARTIN SERVICES INC
JOB NO. 2569 (ALT-7)
FILE NO. 25691AT7

** TEST - INTERACTIVE ESTIMATING **
MINI CROSS SITE XFER. (AH-AZ-AY TO AP TANK FARM)
ORDER OF MAGNITUDE (ALT-7)
PHMCR03 - ESTIMATE BASIS SHEET

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7. REMARKS

MAJOR ASSUMPTIONS WHICH HAVE BEEN MADE IN THE PREPARATION OF THIS ESTIMATE ARE AS FOLLOWS:

EXCAVATION ASSUMPTIONS:

- A.) ALL TRENCH EXCAVATIONS INSIDE FARM AREA ESTIMATED TO BE COMPLETED BY HAND.
- B.) ASSUME MACHINE ASSISTANCE ON TRENCH BACKFILL. THIS INCLUDES DUMP TRUCK & LOADER
- C.) ASSUME ALL FILL FOR SHIELDING BERM WILL BE AVAILABLE IN TANK FARM.
- D.) ASSUME ALL CDF CAN BE PLACED IN FOUR DAYS. MOBE/DEMOBE WAS ESTIMATED FOR FOUR DIFFERENT DAYS.
- E.) ESTIMATE INCLUDES NINE POTHOLE LOCATIONS AS MARKED ON DMGS BY CONSTRUCTION MANAGER. THESE POTHoles ARE ONLY FOR GRADE MARKS. THE POTHoles ARE FIGURED USING THE GUZZLER TO SEE EFFECTIVENESS OF MACHINE.
- F.) SHIELDING BERM FIGURED TO HAVE A FOUR FOOT FLAT TOP WITH 2 TO 1 SLOPES.

PIPELINE (MECHANICAL) ASSUMPTIONS:

- A.) ASSUME ESTIMATE DOES NOT REQUIRE DRAIN FROM AZ PIT.
- B.) ASSUME DEMO'D MATERIALS WILL BE BURIED AS LLW.
- C.) APPLIED AY PIT MODIFICATION AMOUNT TO AP PIT MODIFICATIONS. NO DIRECTION OR DETAIL WERE PROVIDED.
- D.) ASSUME EXCAVATION MATERIALS TO BE HANDLED DURING GREEN FIELD PORTION OF PROJECT WILL BE FREE FROM ANY CONTAMINATION RADIATION OR OTHERWISE.
- E.) ASSUME PIPING CONNECTION TO AN TANK FARM PITS A & B WILL BE OUTSIDE OF PIT. FUNDING FOR REMOVAL & REPLACEMENT OF COVER BLOCKS IN NOT IN ESTIMATE. ALSO RETROFITTING OF JUMPERS IS NOT IN ESTIMATE.
- F.) ASSUME PROCEDURES WILL ALLOW SENSITIVE LEAK TEST OF PIPING AT W-05B CROSS SITE TRANSFER.
- G.) ASSUME LIQW-720 MODIFICATIONS WILL NOT BE ADDRESSED BY THIS PROJECT.
- H.) ASSUME REVISIONS TO CANTON AVE WILL NOT BE REQUIRED
- I.) ASSUME MASTER PUMP SHUTDOWN COSTS WILL BE PROVIDED BY ANOTHER PROJECT, FUNDING IS NOT IN THIS ESTIMATE.

ELECTRICAL & INSTRUMENTATION:

- A.) ELECTRICAL WORK PERFORMED OUTSIDE OF THE TANK FARM, WITH NO SWP FACTOR APPLIED INCLUDES: TERMINAL BOXES CONTROL ENCLOSURES, INSTALLING CONDUITS/FITTINGS, SIRE AND CABLE.
- B.) CATHODIC PROTECTION WILL BE PLACED WHEN THE TRENCH WALLS ARE SHORED.
- C.) ANODE HEADER AND LOOP WILL BE IN THE SAME TRENCH AS PIPE IS RUN.

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FLUOR DANIEL NORTHWEST, INC.
 LOCKHEED MARTIN SERVICES INC
 JOB NO. 2569 (ALT-7)
 FILE NO. 25691AT7

** IEST - INTERACTIVE ESTIMATING **
 MINI CROSS SITE XFER (AN-AZ-AY TO AP TANK FARM)
 ORDER OF MAGNITUDE (ALT-7)
 PHNCR04 - COMPANY/WBS SUMMARY

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SORT CODE/WBS	DESCRIPTION	ESTIMATE	ESCALATION		SUB	CONTINGENCY		SUB	SITE ALLOCAT'N	TOTAL DOLLARS
		SUBTOTAL	%	TOTAL	TOTAL	%	TOTAL	TOTAL		
FDH	FLUOR DANIEL HANFORD, INC.									
310000	HEALTH PHYSICS TECHNICIAN	800315	2.29	18327	818642	15	122796	941438	0	941438
	SUBTOTAL 31 TOTAL C/FORCES CONSTRUC	800315	2.29	18327	818642	15	122796	941438	0	941438
	SUBTOTAL 3 TOTAL CONSTRUCTION	800315	2.29	18327	818642	15	122796	941438	0	941438
	TOTAL FDH FLUOR DANIEL HANFORD, INC.	800315	2.29	18327	818642	15	122796	941438	0	941438
FDNW	FLUOR DANIEL NORTHWEST									
111000	DEFINITIVE DESIGN	2754000	0.00	0	2754000	10	275400	3029400	1053322	4082722
	SUBTOTAL 11 ENGINEERING	2754000	0.00	0	2754000	10	275400	3029400	1053322	4082722
121000	ENGINEERING INSPECTION	2349000	2.29	53792	2402792	10	240279	2643071	918995	3562067
	SUBTOTAL 1 ENGINEERING	5103000	1.05	53792	5156792	10	515679	5672471	1972318	7644789
311AP2	241-AP VALVE PIT MODIFICATIONS	369281	2.29	8456	377737	15	56660	434398	141996	576394
	SUBTOTAL 311AP AP TNK/FRM PIT UPGRADES	369281	2.29	8456	377737	15	56660	434398	141996	576394
311AY1	AY-101 PUMP PIT MODIFICATONS	369281	2.29	8456	377737	15	56660	434398	141996	576394
311AY2	AY-102 PUMP PIT MODIFICATONS	612721	2.29	14031	626753	15	94012	720765	202847	923613
	SUBTOTAL 311AY AY TNK/FRM PIT UPGRADES	982002	2.29	22487	1004490	15	150673	1155164	344843	1500008
311AZ1	AZ-101 PUMP PIT MODIFICATIONS	1098564	2.29	25157	1123721	15	168558	1292279	421021	1713300
311AZ2	AZ-102 PUMP PIT MODIFICATIONS	875134	2.29	20040	895175	15	134276	1029451	341102	1370554
	SUBTOTAL 311AZ AZ TNK/FRM PIT UPGRADES	1973698	2.29	45197	2018896	15	302834	2321730	762124	3083854
312AN1	TANK AN-101 TO GRN/FLD BY - PASS	453422	2.29	10383	463805	15	69570	533376	173643	707019

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APPENDIX H

ALTERNATIVES 3, 7, AND 7B

PIPING DRAWINGS

HNF-2500
Revision 0

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W 48000

W 47500

W 47000

W 46500

DWG INDEX

N42500

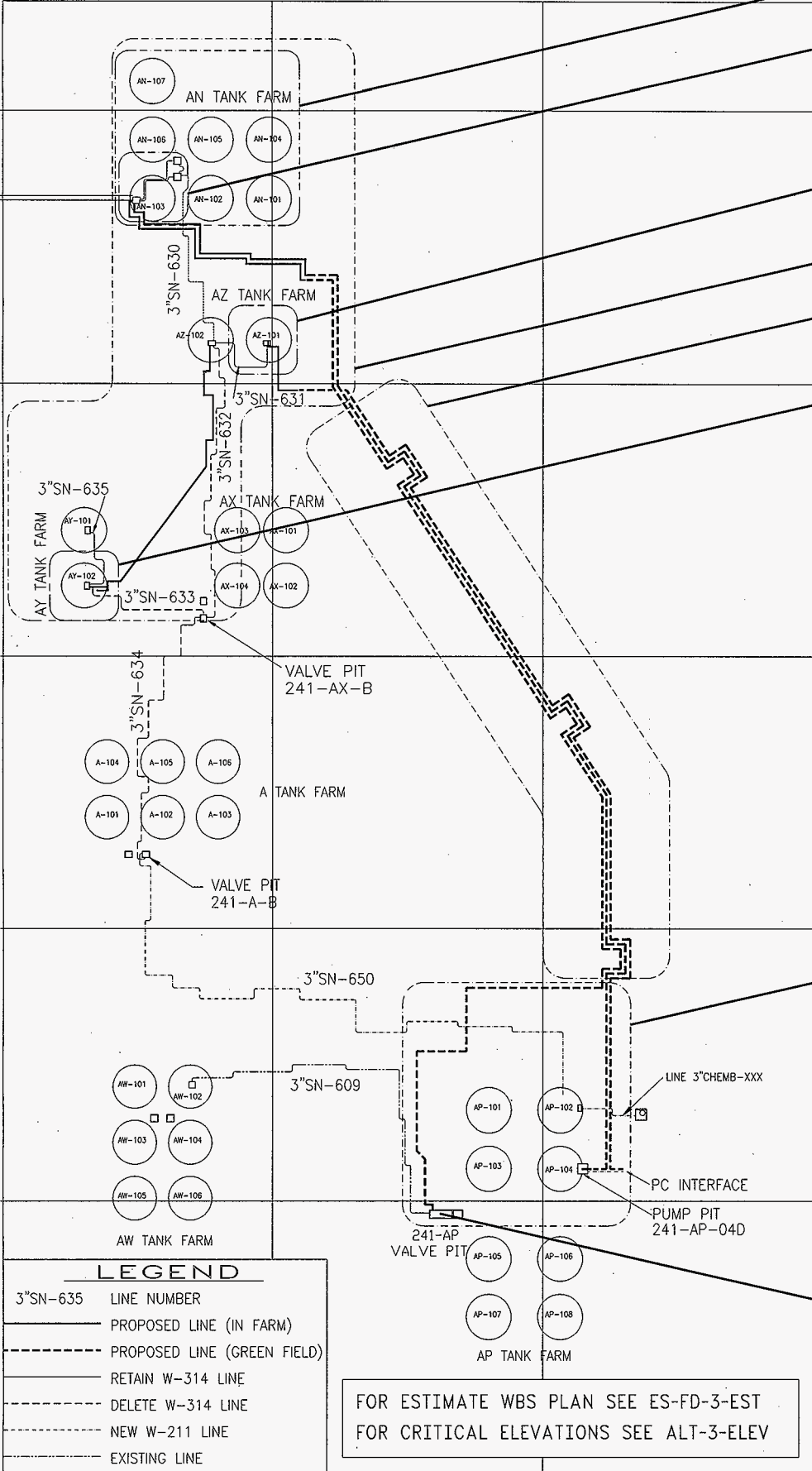
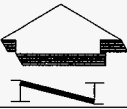
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N40000



- ES-FD-P1
- ES-FD-P4
- ES-FD-P16
- ES-FD-P6
- ES-FD-P12
- ES-FD-C3
- ES-FD-C2
- ES-FD-P8
- ES-FD-P14

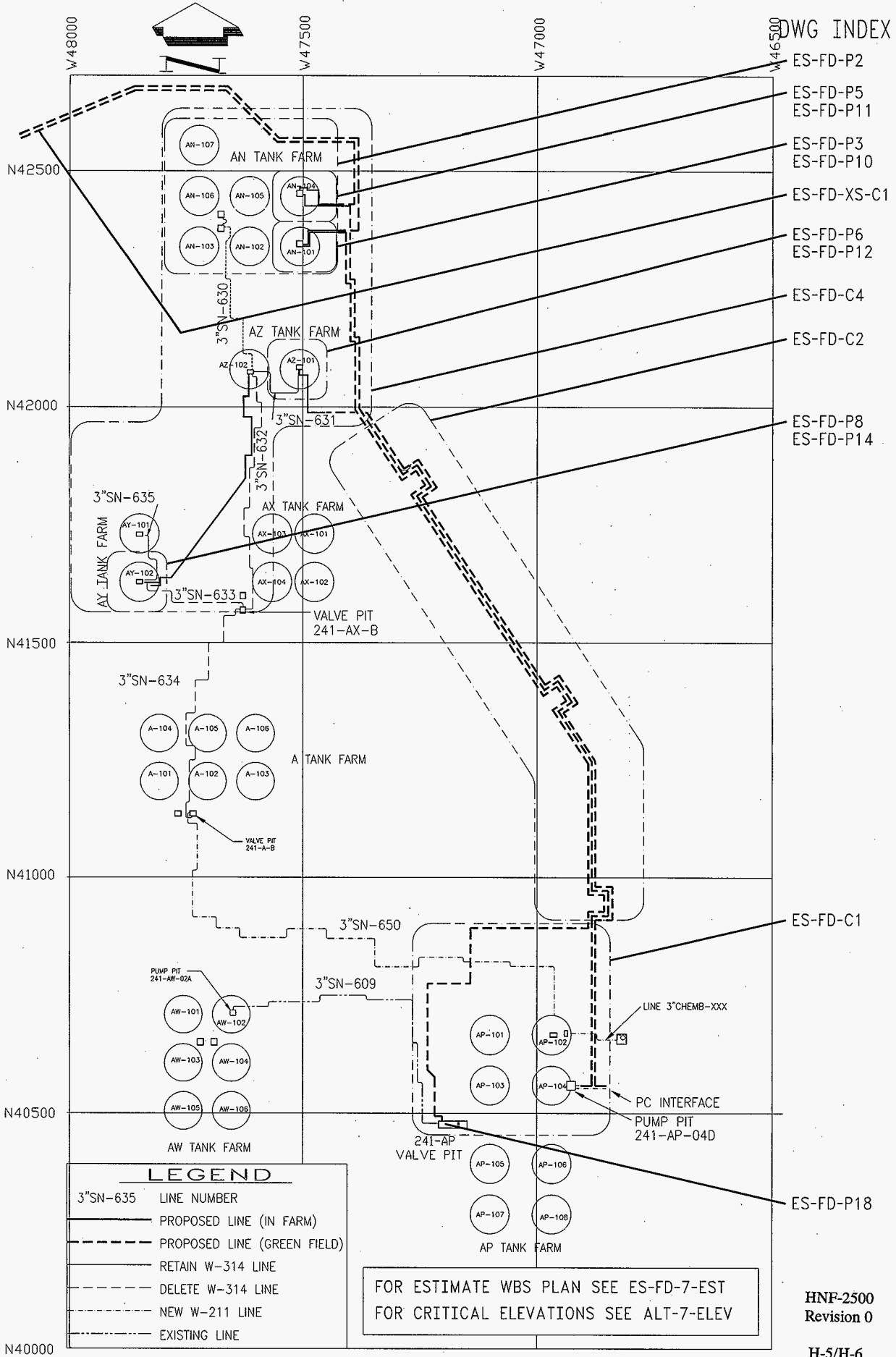
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- ES-FD-P18

LEGEND	
3"SN-635	LINE NUMBER
	PROPOSED LINE (IN FARM)
	PROPOSED LINE (GREEN FIELD)
	RETAIN W-314 LINE
	DELETE W-314 LINE
	NEW W-211 LINE
	EXISTING LINE

FOR ESTIMATE WBS PLAN SEE ES-FD-3-EST
 FOR CRITICAL ELEVATIONS SEE ALT-3-ELEV

ALTERNATIVE 3 KEY PLAN & DWG INDEX

HNF-2500
 Revision 0
 H-3/H-4



DWG INDEX

- ES-FD-P2
- ES-FD-P5
- ES-FD-P11
- ES-FD-P3
- ES-FD-P10
- ES-FD-XS-C1
- ES-FD-P6
- ES-FD-P12
- ES-FD-C4
- ES-FD-C2
- ES-FD-P8
- ES-FD-P14

- ES-FD-C1
- ES-FD-P18

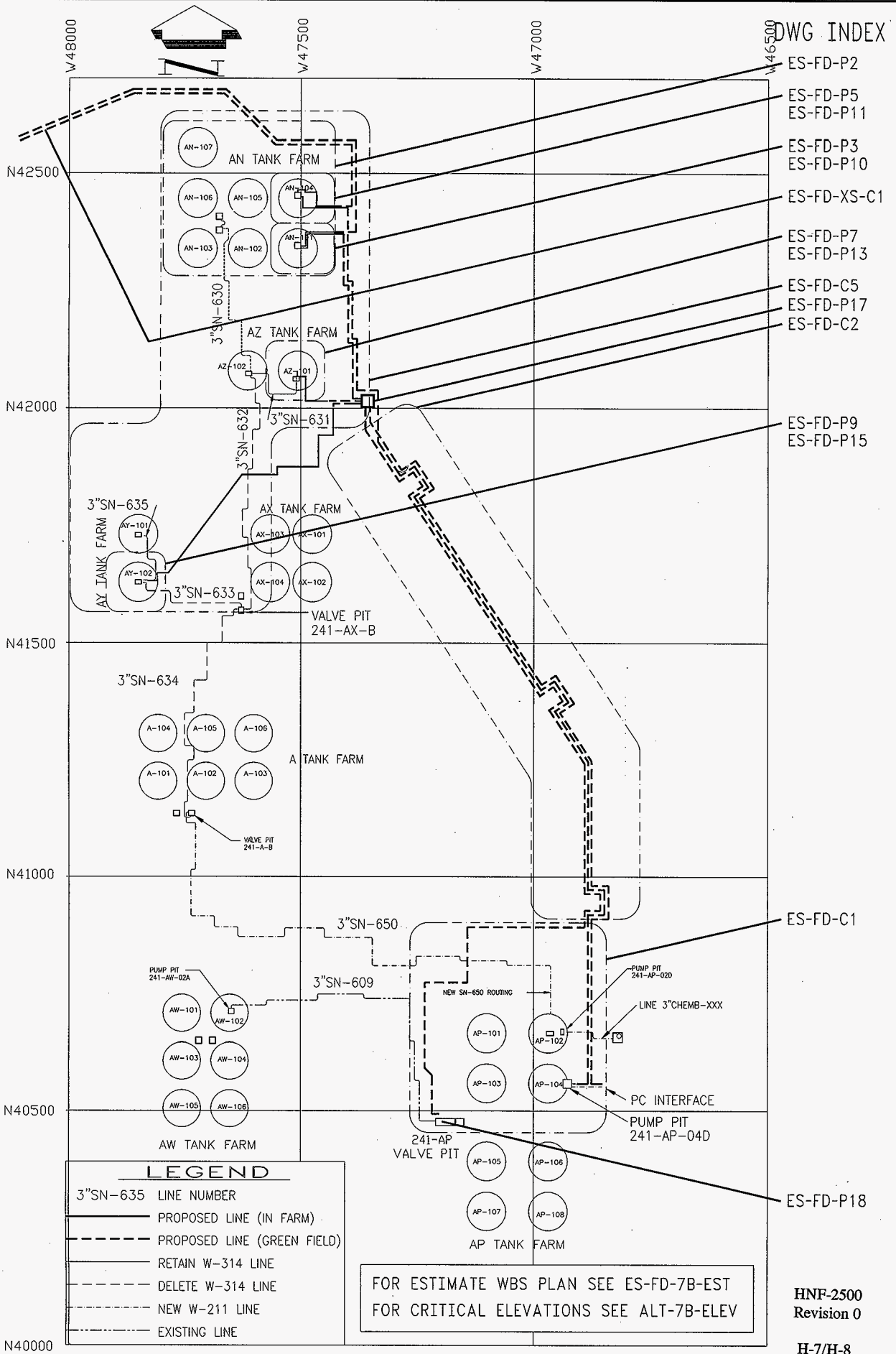
LEGEND

3"SN-635	LINE NUMBER
	PROPOSED LINE (IN FARM)
	PROPOSED LINE (GREEN FIELD)
	RETAIN W-314 LINE
	DELETE W-314 LINE
	NEW W-211 LINE
	EXISTING LINE

FOR ESTIMATE WBS PLAN SEE ES-FD-7-EST
 FOR CRITICAL ELEVATIONS SEE ALT-7-ELEV

HNF-2500
 Revision 0
 H-5/H-6

ALTERNATIVE 7 KEY PLAN & DWG INDEX



DWG INDEX

- ES-FD-P2
- ES-FD-P5
- ES-FD-P11
- ES-FD-P3
- ES-FD-P10
- ES-FD-XS-C1
- ES-FD-P7
- ES-FD-P13
- ES-FD-C5
- ES-FD-P17
- ES-FD-C2
- ES-FD-P9
- ES-FD-P15

ES-FD-C1

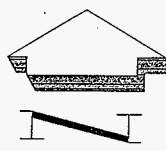
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LEGEND	
3"SN-635	LINE NUMBER
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	PROPOSED LINE (GREEN FIELD)
	RETAIN W-314 LINE
	DELETE W-314 LINE
	NEW W-211 LINE
	EXISTING LINE

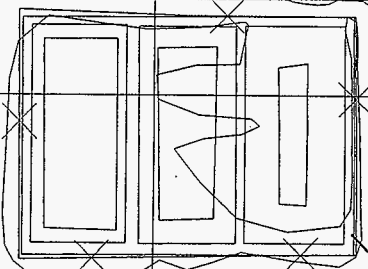
FOR ESTIMATE WBS PLAN SEE ES-FD-7B-EST
 FOR CRITICAL ELEVATIONS SEE ALT-7B-ELEV

HNF-2500
 Revision 0
 H-7/H-8

ALTERNATIVE 7B KEY PLAN & DWG INDEX



N41000



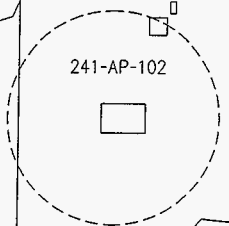
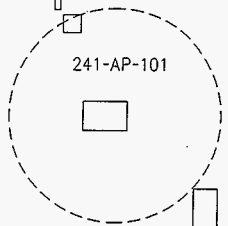
ES-FD-C2
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206

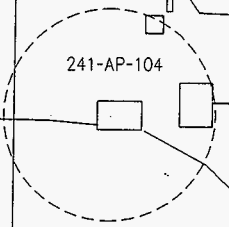
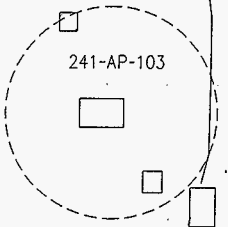
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241AP

"GREEN FIELD"
TEMPORARY FENCE



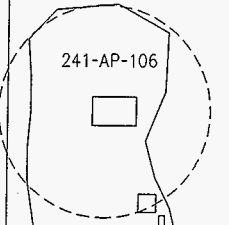
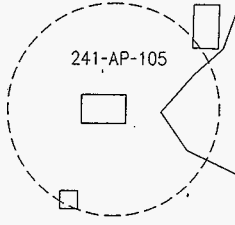
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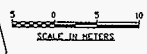
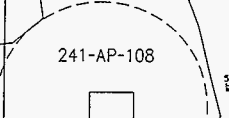
241-AP VALVE PIT

N40500



HNF-2500
Revision 0

H-9/H-10



W47250

W47000

FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
P LAING
Checked by:

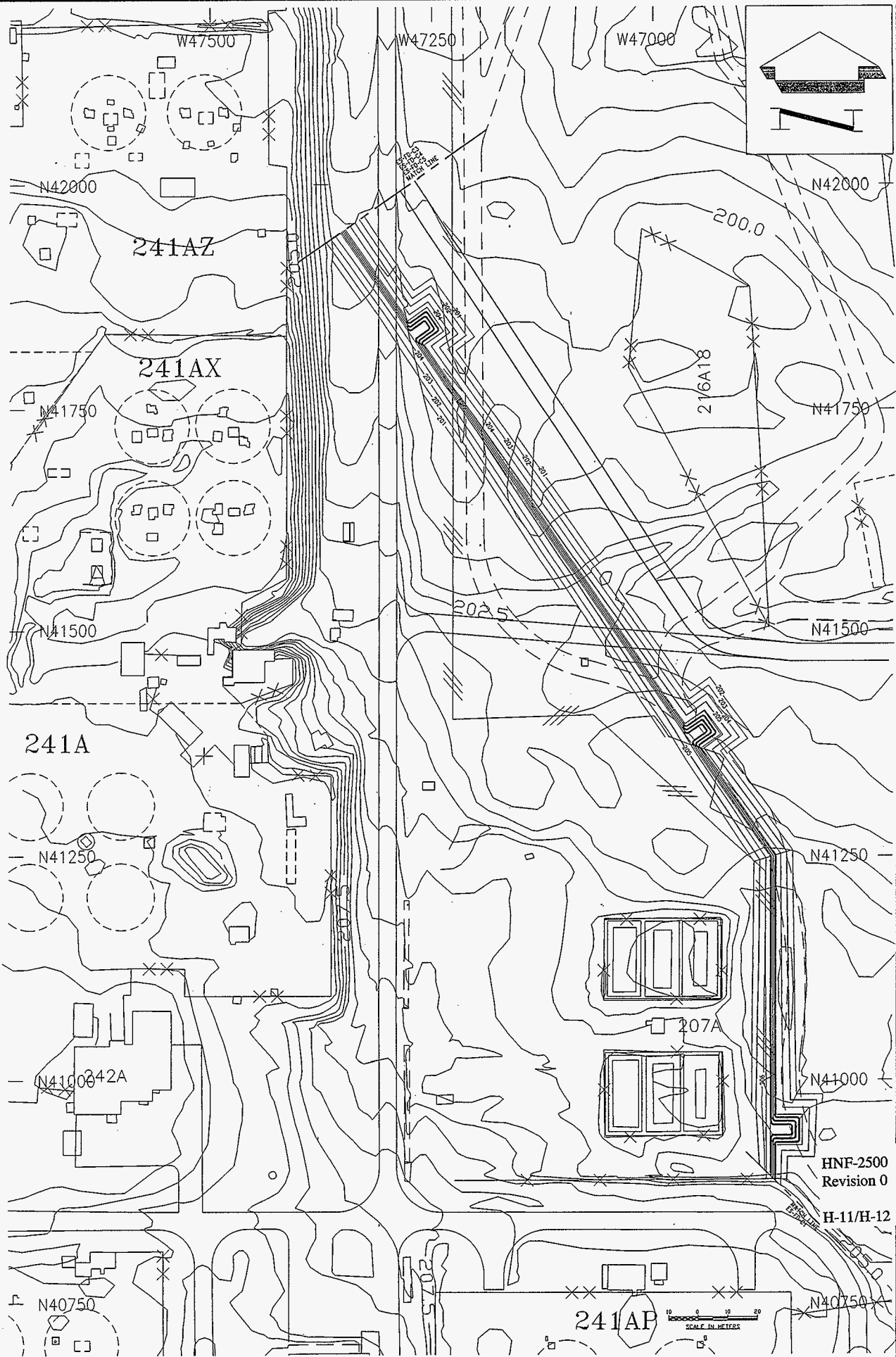


CIVIL (ALTN 3, 7, & 7B)
GREEN FIELD PLAN
AP TANK FARM

Sketch no.

ES-FD-C1

4717/98	Issue
1	10
	Rev
IFDC1	0

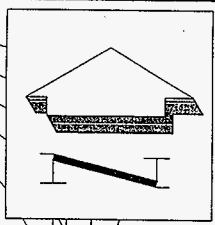
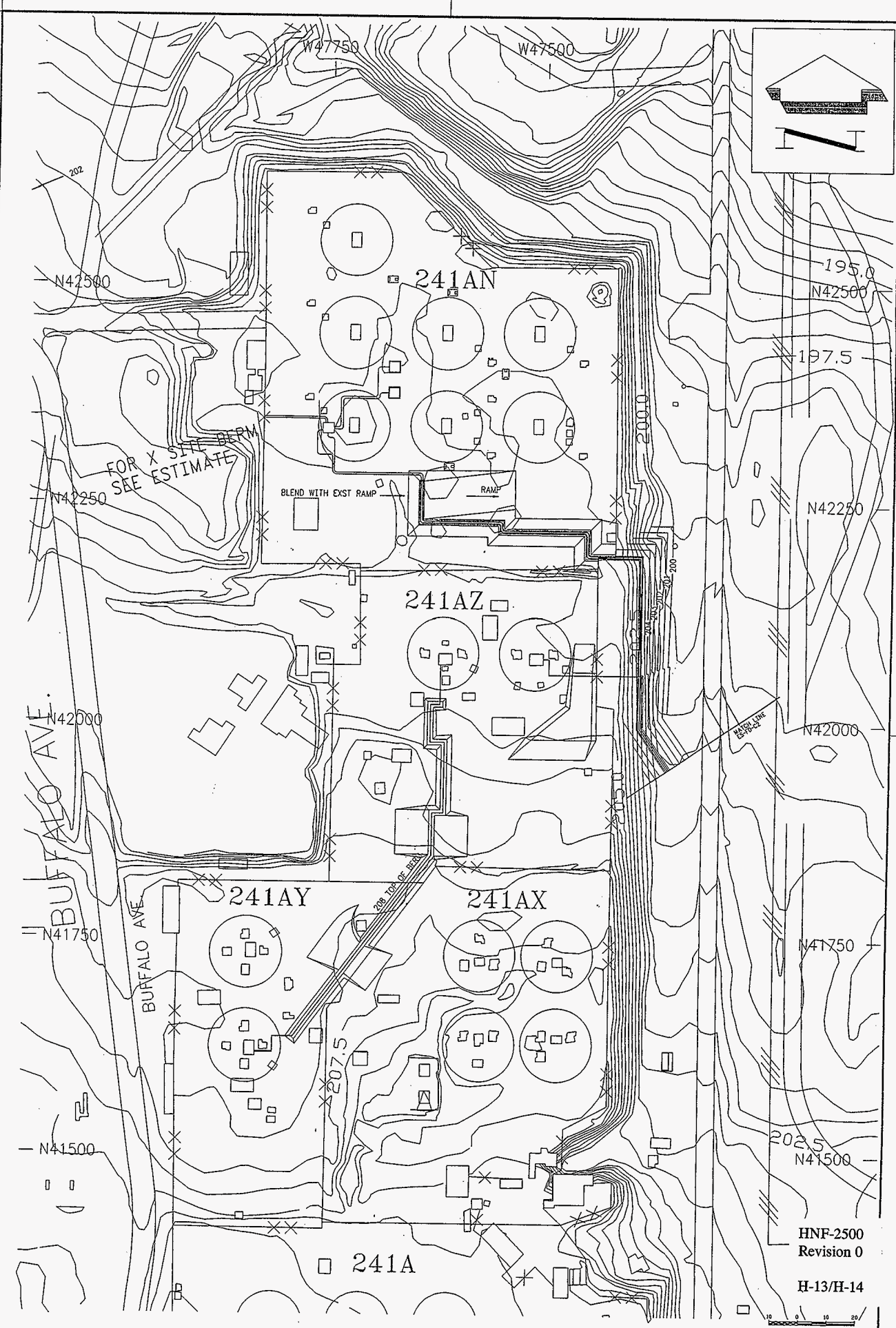


FEED DELIVERY CONCEPTUAL DESIGN

Prepared by: P LAING
 Reviewed by: **FLUOR DANIEL NORTHWEST**

CIVIL (ALTN 3, 7, & 7B)
 GREEN FIELD PLAN
 AN/AZ TANK FARM TO AP TANK FARM

Sketch no.: ES-FD-C2
 Date: 4/17/98
 Rev: 1
 Issue: 9
 IFC2: 0



195.0
N42500

197.5

N42250

N42000

N41750

202.5
N41500

HNF-2500
Revision 0

H-13/H-14

0 10 20
SCALE IN METERS

FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
P LAING
Reviewed by:

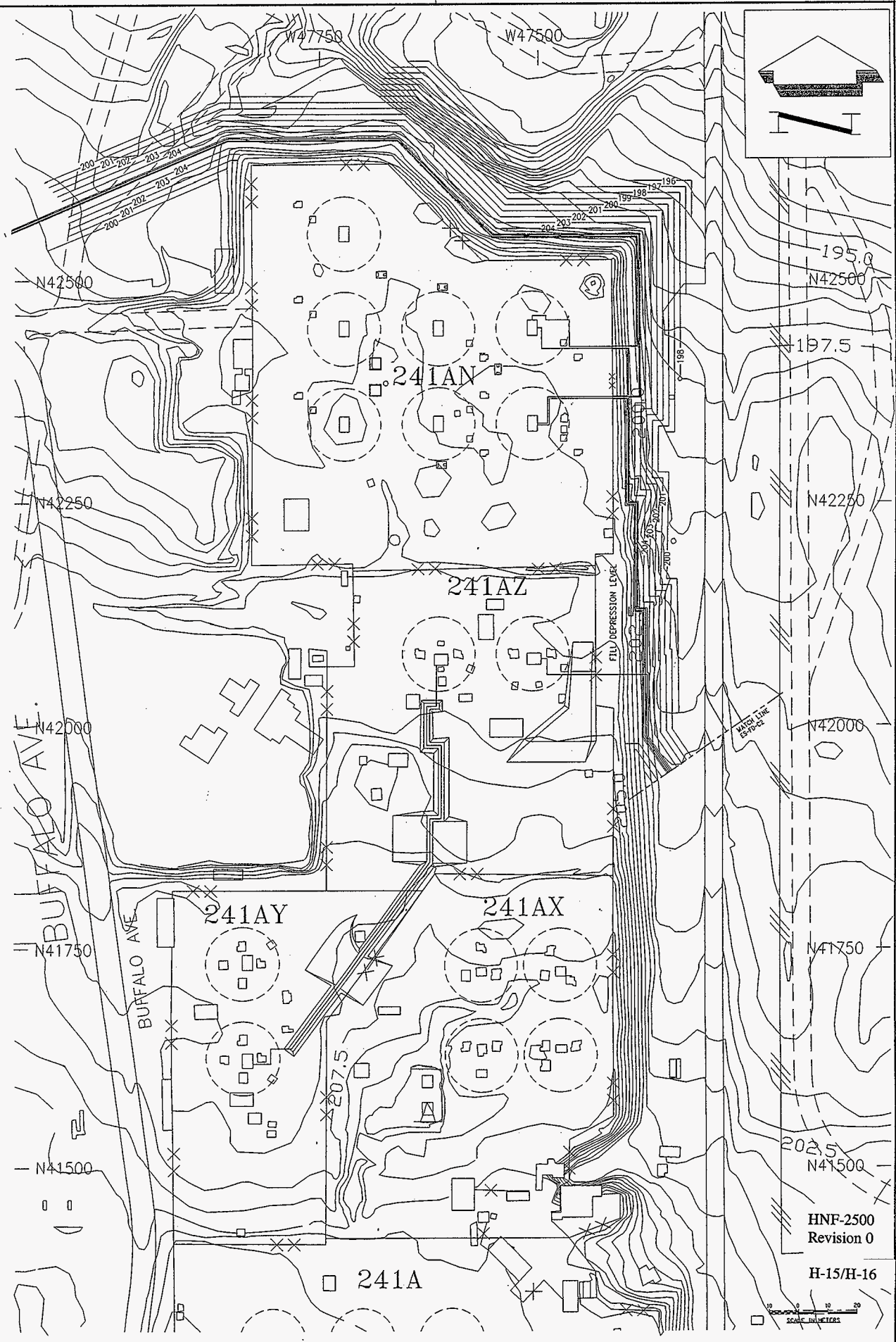


CIVIL (ALTN 3)
TANK FARM PLAN

Sketch no.

ES-FD-C3

Issue	4/17/98
Rev	9
IFDC3	0



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
 P LAING
 Reviewed by:

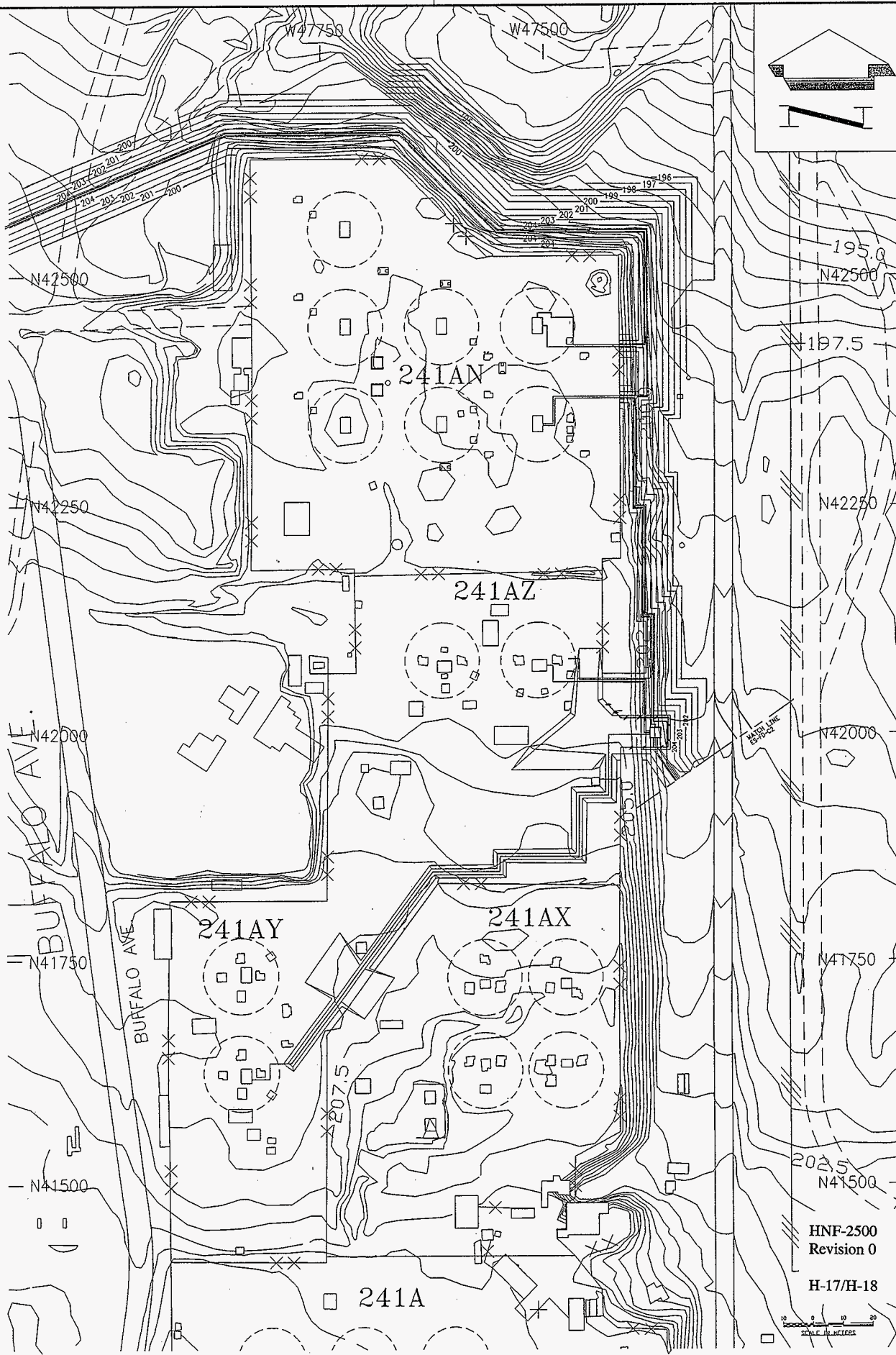


FLUOR DANIEL NORTHWEST

CIVIL (ALTN 7)
 GREEN FIELD PLAN
 AND TANK FARM PLAN

Sketch no. ES-FD-C4

Date	4/17/98
Sheet	9
Rev	1
Rev	0
Code	LFDC4



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
P LAING
Reviewed by:



FLUOR DANIEL NORTHWEST

CIVIL (ALTN 7B)
GREEN FIELD PLAN
AND TANK FARM PLAN

Sketch no.
ES-FD-C5

17/98	9
1	0
IFDCS	



N42500

W48500

W48250

W48000

SURVEILLANCE CABLE H-2-38943

271CR

φ 668.45

φ 667.85

RELOCATE HYDRANT

N42500

N42250

3'-0" MIN COVER

1 1 1/2" RW H-2-38201
1172' S (1504) H-2-38201

CONIC ENCASE H-2-36642
φ 67134

φ 662.35

205.0

8" RW H-2-55994

φ 669.84

φ 672.2

INV 674.48 12" RW

φ 679.35

N42000

φ 676.11 ENCASE

N41750

X SITE LINES
φ 679.75
H-2-822228

12" RW H-2-131004

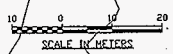
BUFFALO VE.

3" V103 H-2-58669

BOE 805.33

3" SW H-2-32981

ENCASE 8056 H-2-44778



241AN

241A201

241A2271

241AY

HNF-2500
Revision 0

H-19/H-20

FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
P LAING
Reviewed by:
FLUOR DANIEL NORTHWEST

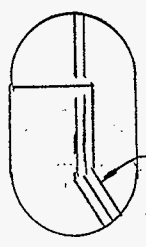
CIVIL (ALTN 7 & 7B)
X SITE EXTENSION

Sketch no.
ES-FD-XS-C1

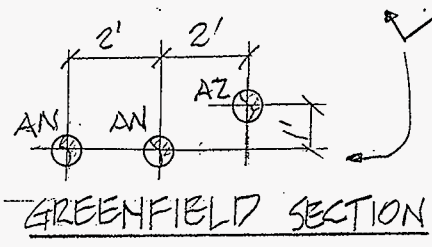
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Sheet: 5
Rev: 0
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667.00
 666.75
 666.42 AN-VALVE PITS

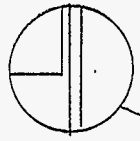
AZ-101
 668.83



670.00 - AZ
 669.00 - AN
 669.00 - AN



672.34 AN
 672.34 AN
 673.34 AZ



HNF-2500
 Revision 0
 H-21/H-22

673.34
 672.86
 AP-104

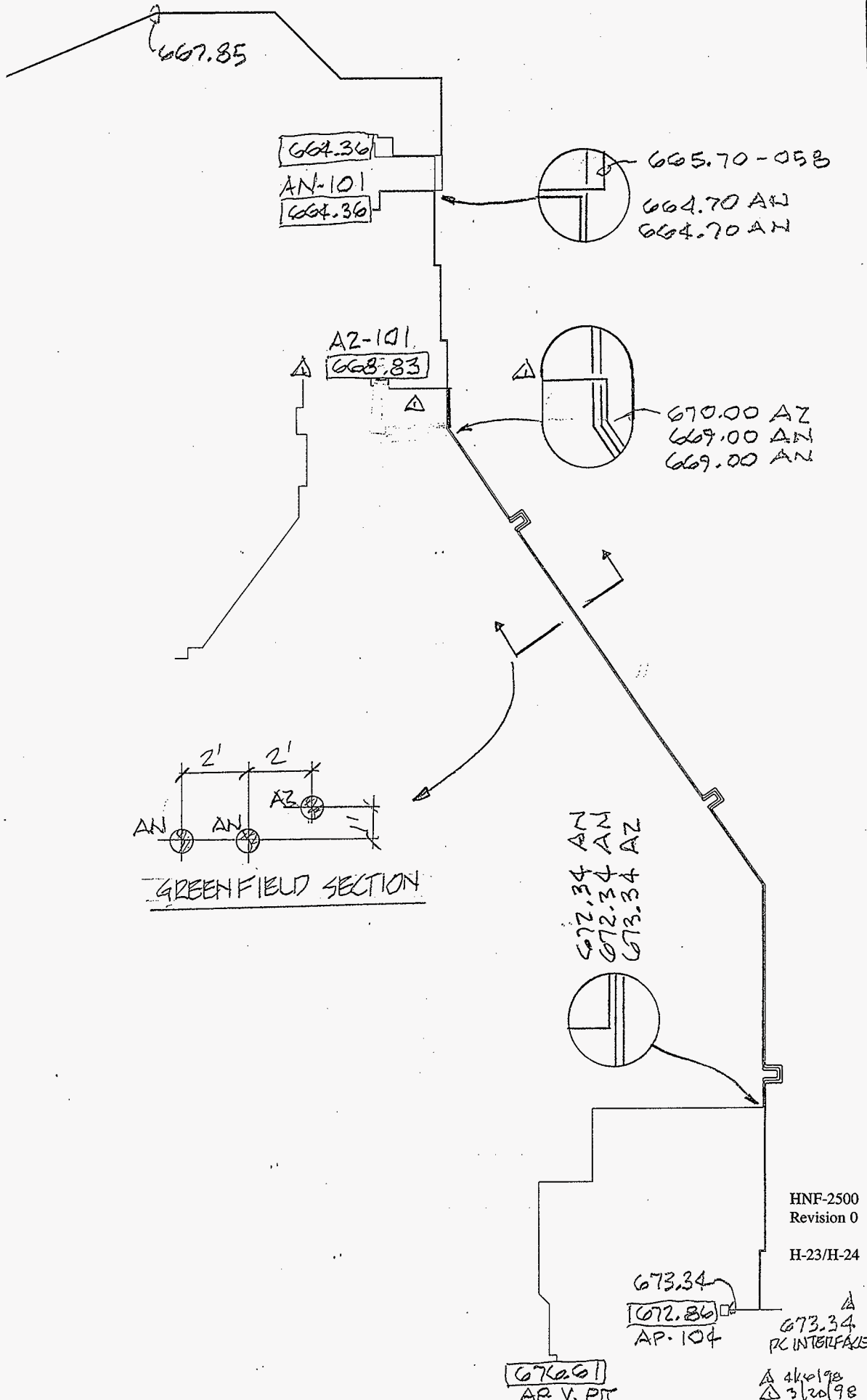
674.34
 PC INTERFACE

676.61
 AP. V. PIT

▲ 4/14/98
 ▲ 3/20/98

FEED DELIVERY CONCEPTUAL DESIGN

Prepared by: P. LATHG 3/18	FLUOR DANIEL NORTHWEST	ALTERNATIVE 3 CRITICAL ELEVATIONS	Sketch no. ALT 3 ELEV	<table border="1"> <tr> <td>DATE</td> <td>BY</td> <td>REV</td> </tr> <tr> <td>03/20/98</td> <td>1</td> <td>2</td> </tr> <tr> <td>ALT3ELEV</td> <td></td> <td>0</td> </tr> </table>	DATE	BY	REV	03/20/98	1	2	ALT3ELEV		0
DATE	BY	REV											
03/20/98	1	2											
ALT3ELEV		0											



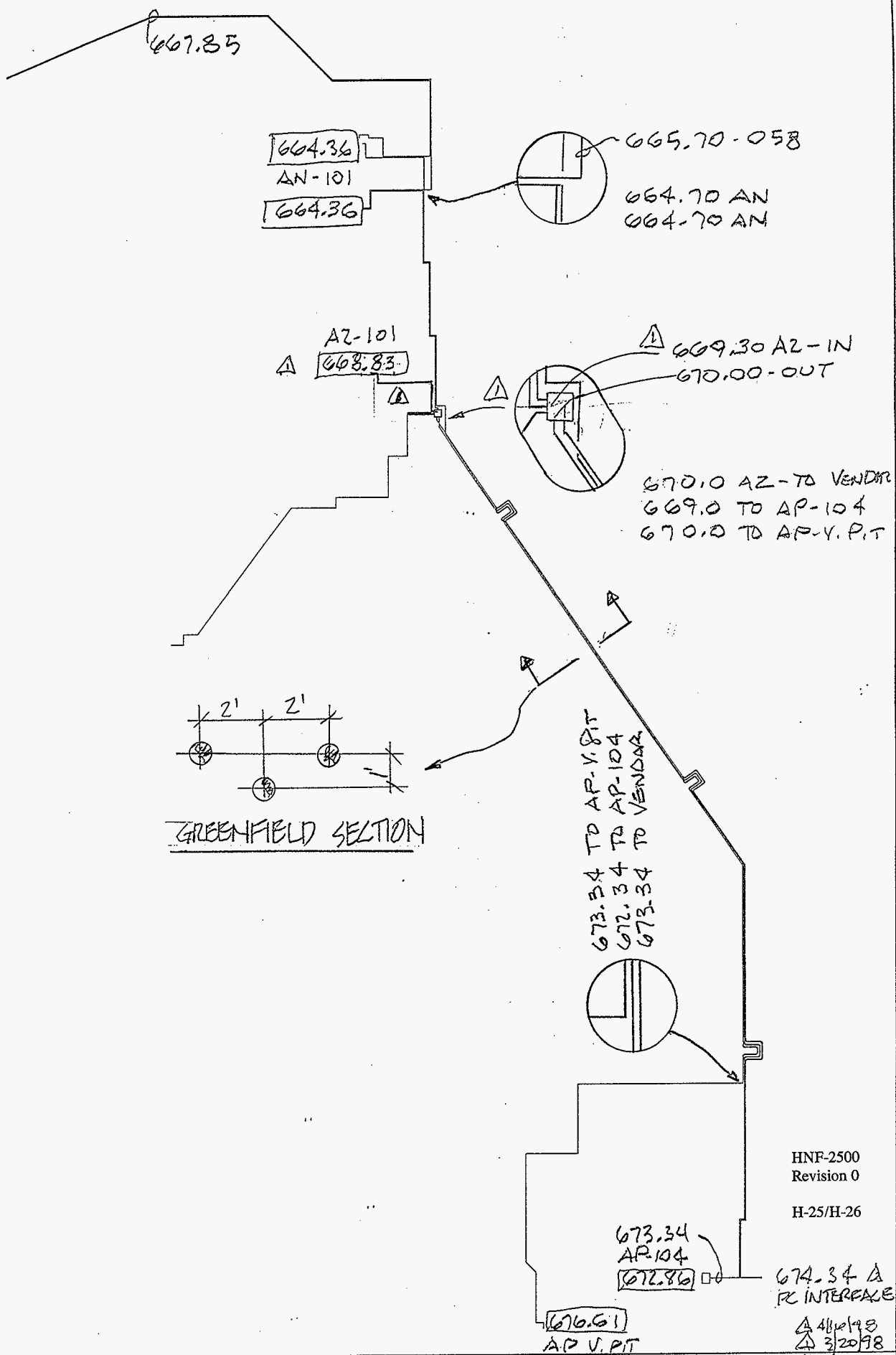
FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
P LAING
Reviewed by:
FLUOR DANIEL NORTHWEST

ALTERNATIVE 7
CRITICAL ELEVATIONS

Sheet no.
ALT 7 ELEV
Date: 2/20/98
Rev: 1
Alt/Elev: 0

2
0



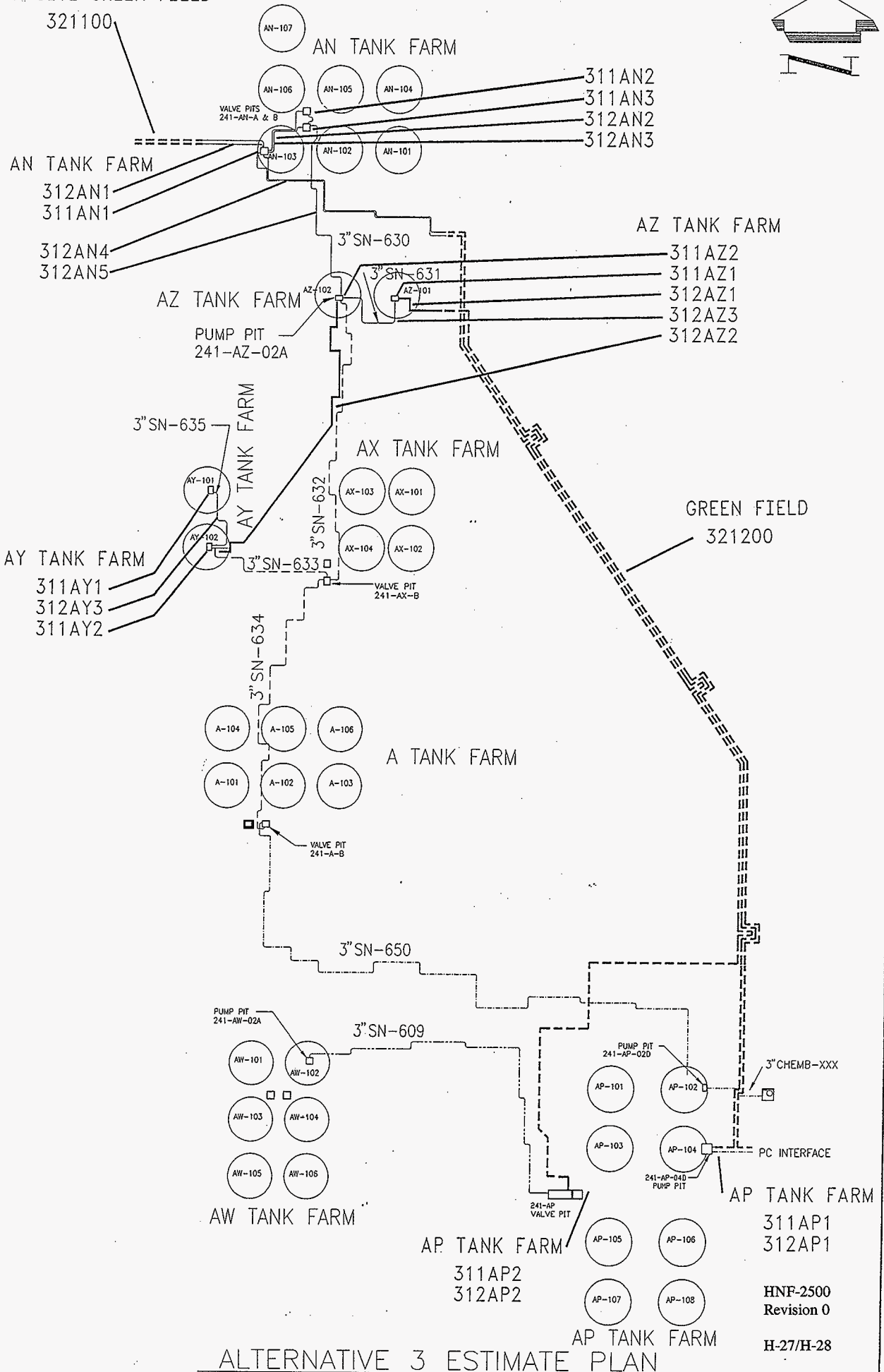
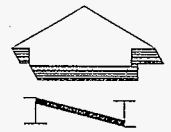
HNF-2500
Revision 0
H-25/H-26

FEED DELIVERY CONCEPTUAL DESIGN

Prepared by: P LAING	FLUOR DANIEL NORTHWEST	ALTERNATIVE 7B CRITICAL ELEVATIONS	Sketch no. ALT 7B ELEV	Sheet 1	Drawn 2
Reviewed by:				Rev 0	0

X SITE GREEN FIELD

321100

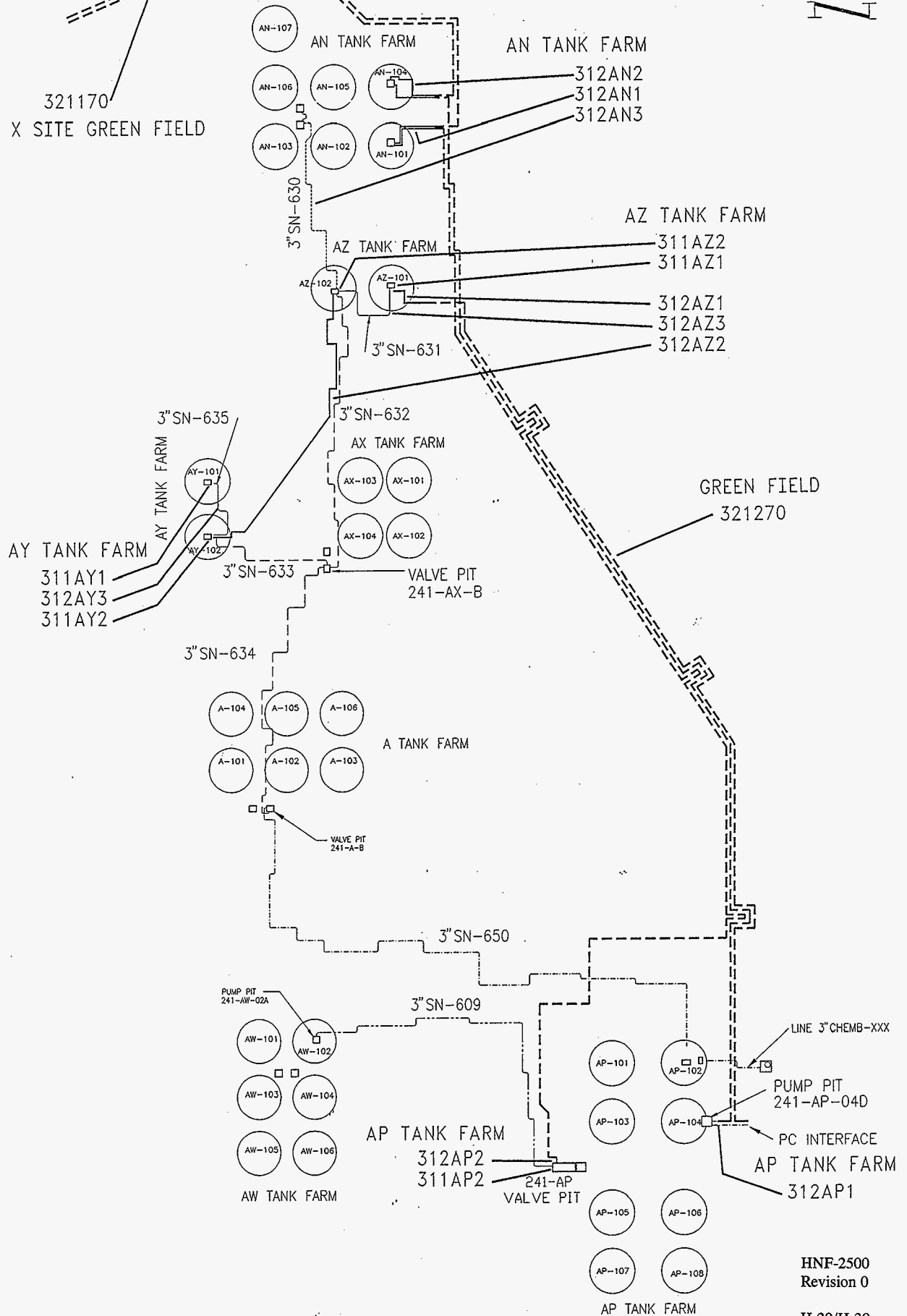


ALTERNATIVE 3 ESTIMATE PLAN

- 311AN2
- 311AN3
- 312AN2
- 312AN3
- 312AN1
- 311AN1
- 312AN4
- 312AN5
- 311AZ2
- 311AZ1
- 312AZ1
- 312AZ3
- 312AZ2
- 311AY1
- 312AY3
- 311AY2
- 311AP1
- 312AP1
- HNF-2500
- Revision 0
- H-27/H-28



321170
X SITE GREEN FIELD

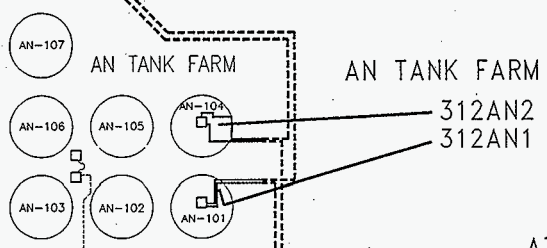


ALTERNATIVE 7 ESTIMATE PLAN

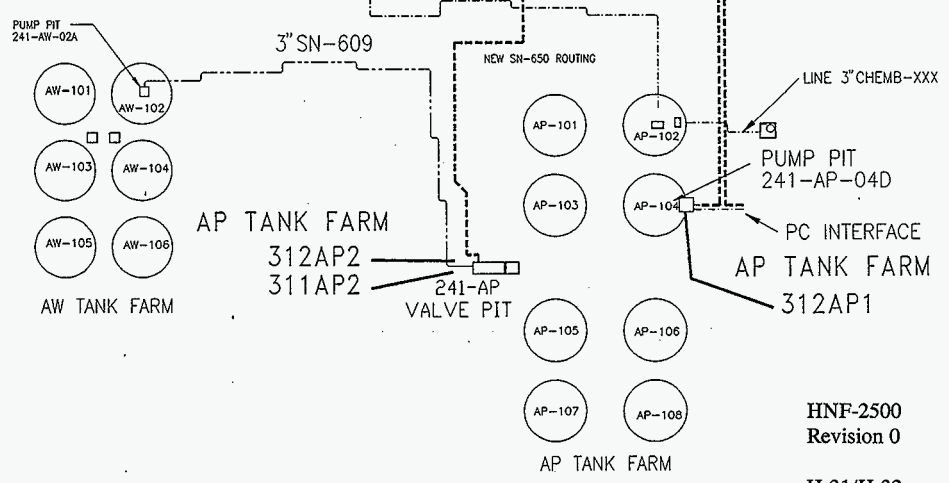
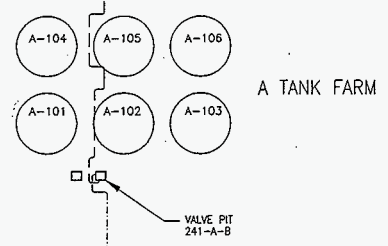
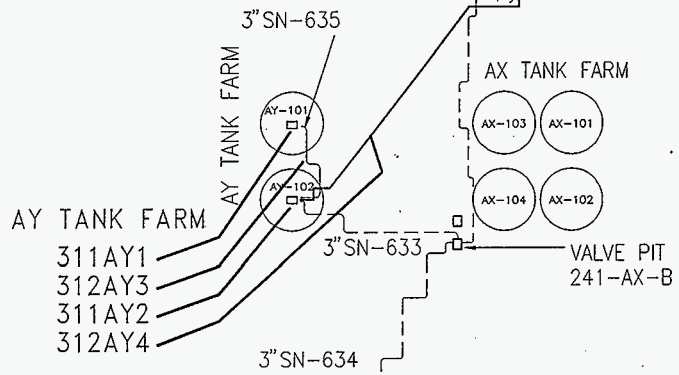
HNF-2500
Revision 0
H-29/H-30



32117B
X SITE GREEN FIELD

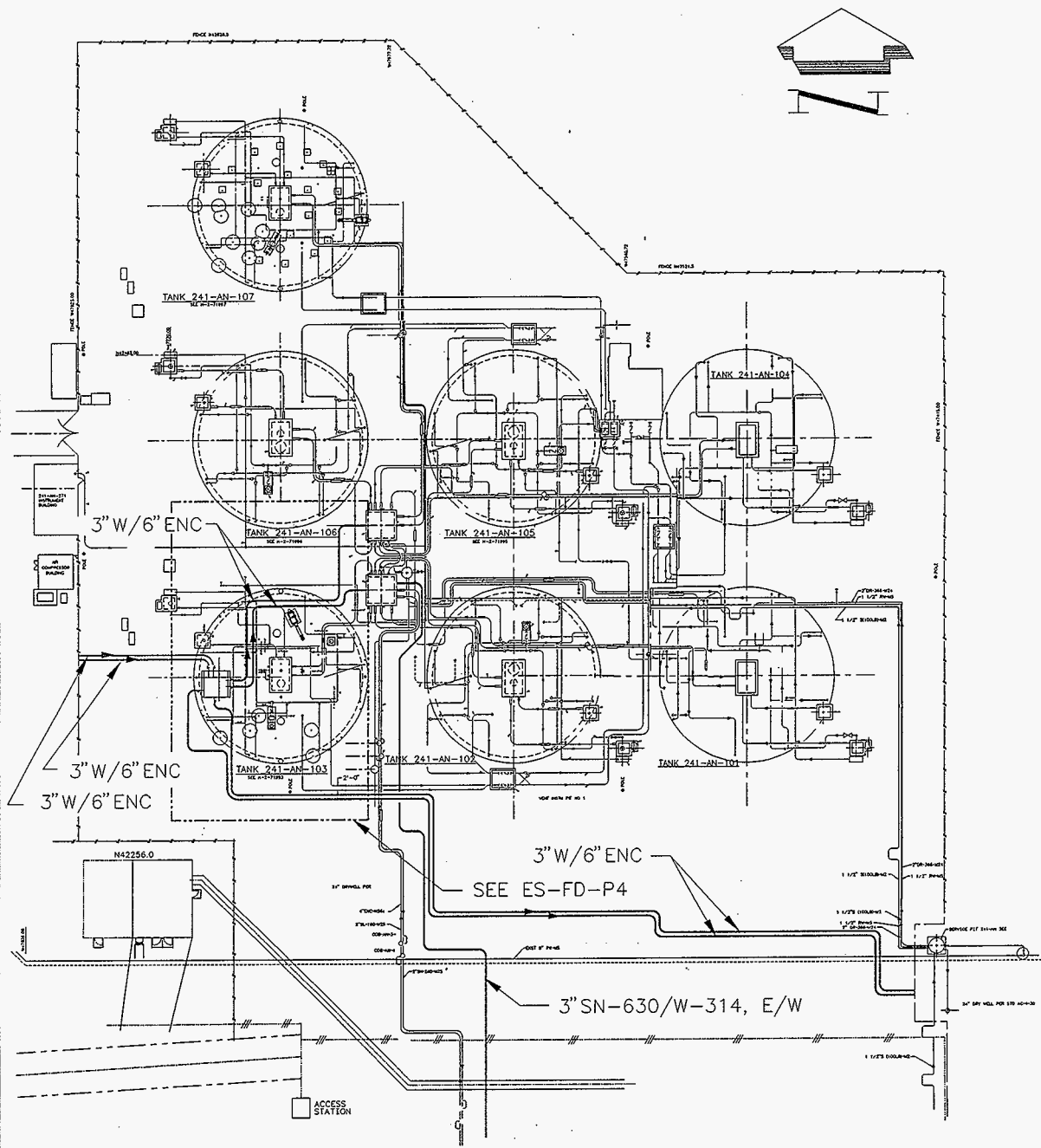


GREEN FIELD
32137B
32127B



HNF-2500
Revision 0
H-31/H-32

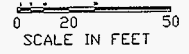
ALTERNATIVE 7B ESTIMATE PLAN



PLAN
TANK FARM, 241-AN

HNF-2500
Revision 0

H-33/H-34



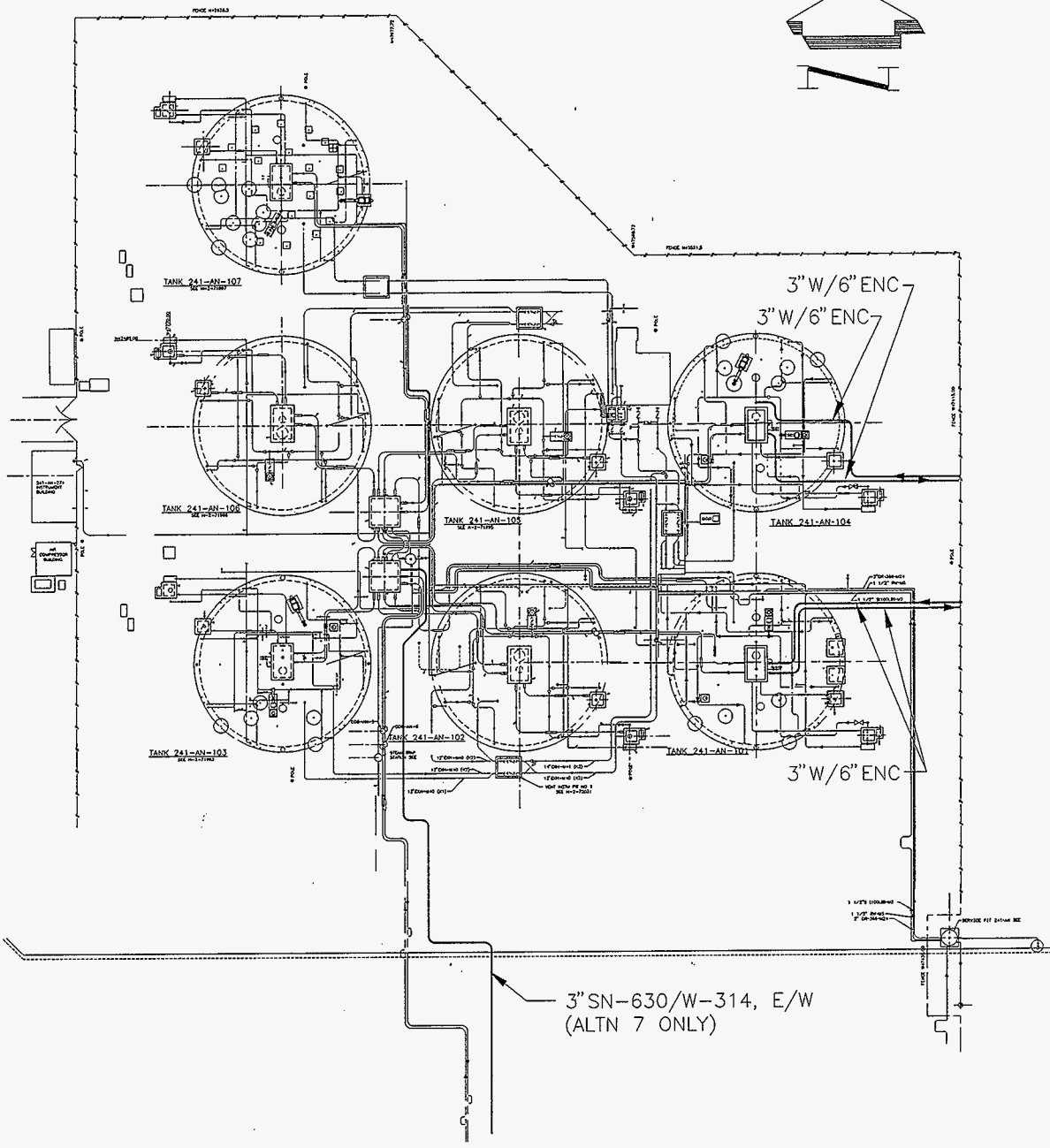
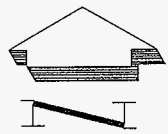
FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
Wm ZICKUHR
Reviewed by:



PIPING (ALTN 3)
TANK FARM PLAN, 241-AN

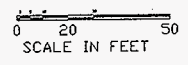
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ES-FD-P1	4717/98	5
	Rev.	0
	ANPLAN	



PLAN
TANK FARM, 241-AN

HNF-2500
Revision 0

H-35/H-36



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
Wm ZICKUHR
Reviewed by:



PIPING (ALTN 7&7B)
TANK FARM PLAN 241-AN

Sketch no.	17/98	Sheet	5
		Rev	0
		ANPLAN	0

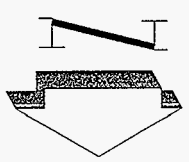
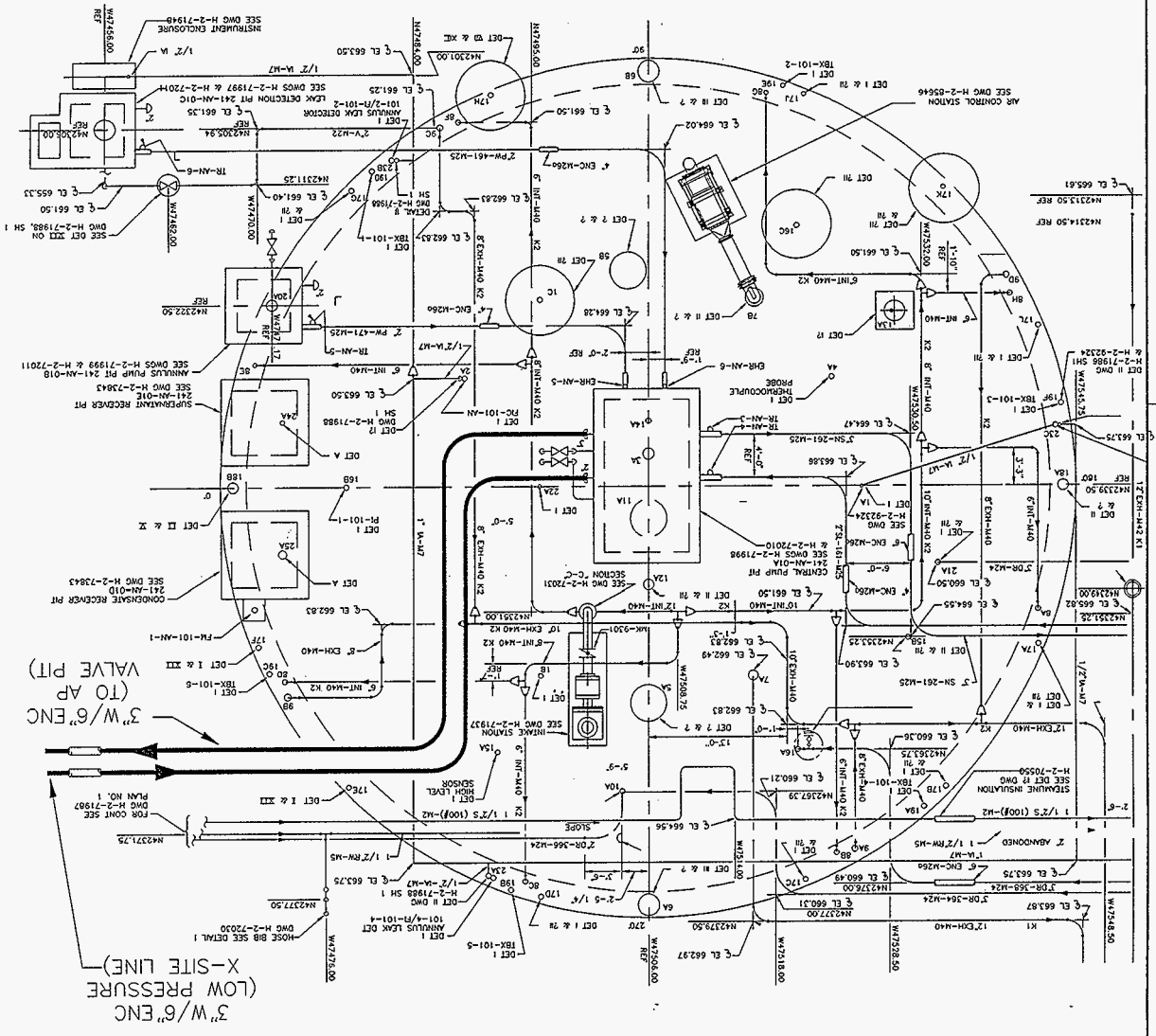
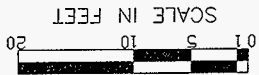
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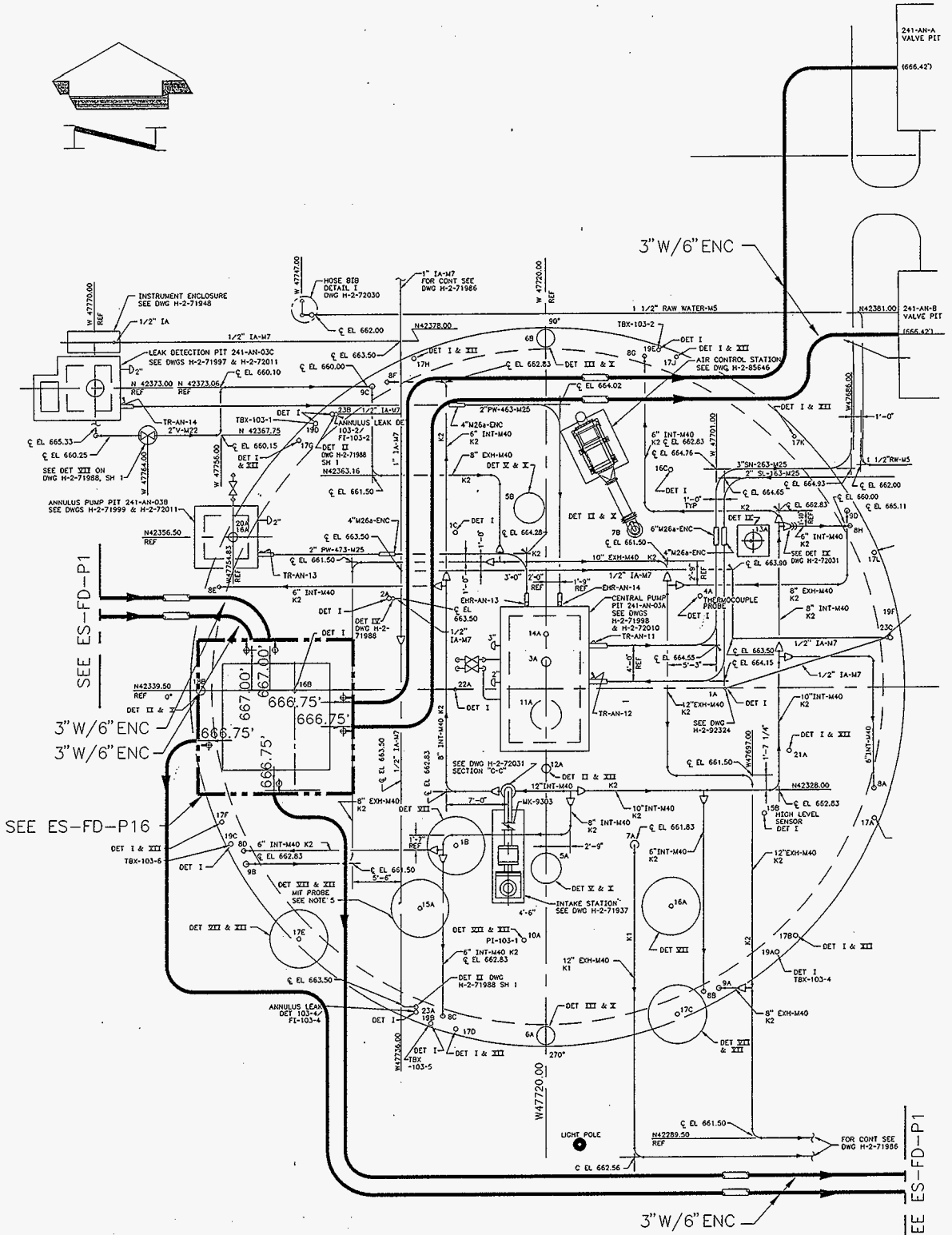
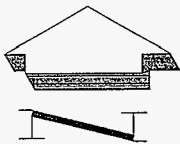
FEED DELIVERY CONCEPTUAL DESIGN

PLAN
TANK, 241-AN-101

H-37/H-38

Revision 0
HNF-2500

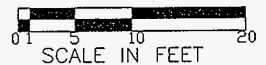




PLAN
TANK, 241-AN-103

HNF-2500
Revision 0

H-39/H-40

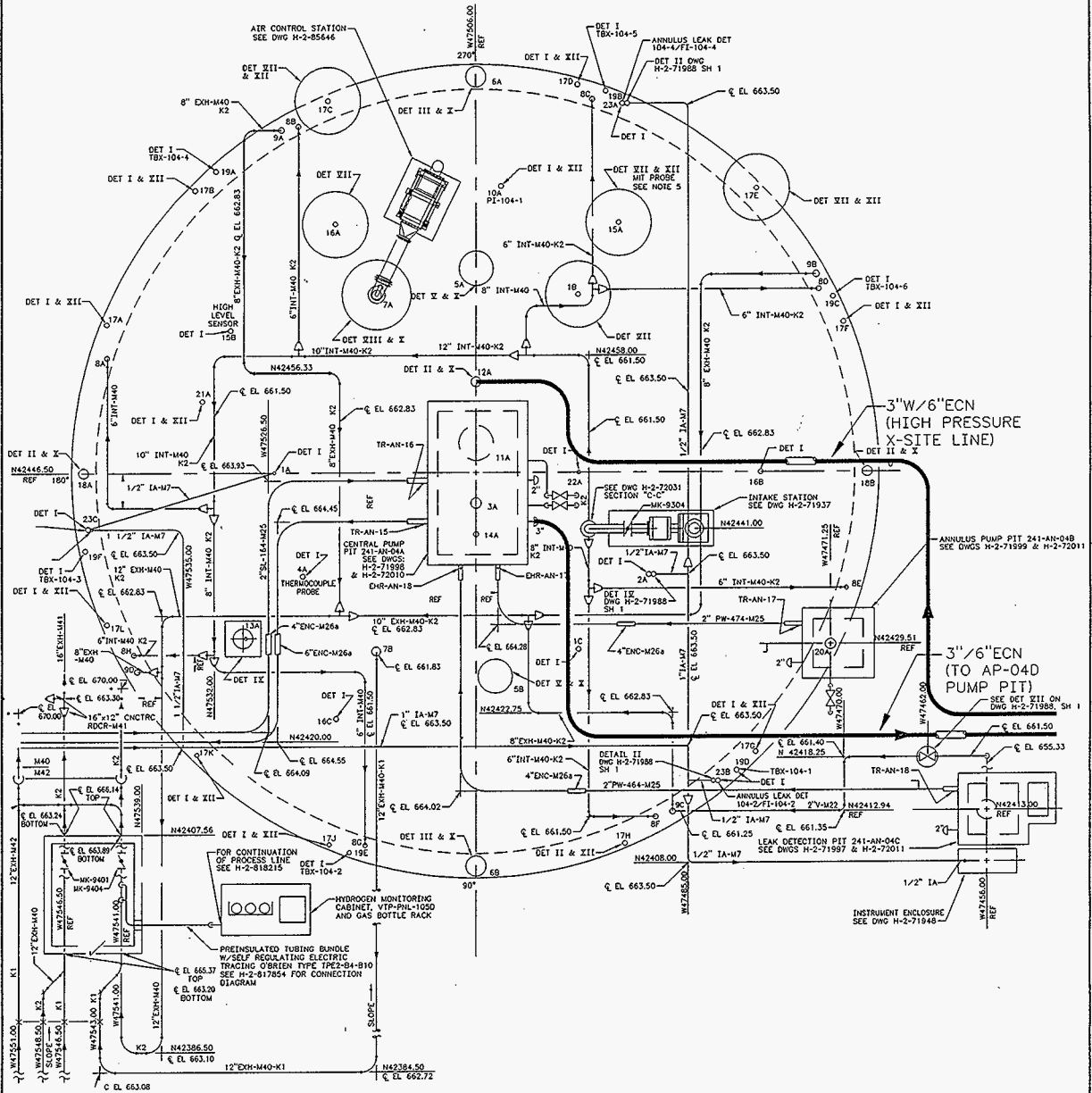
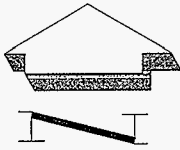


FEED DELIVERY CONCEPTUAL DESIGN

Prepared by: Wm ZICKLHR
Reviewed by: FLUOR DANIEL NORTHWEST

PIPING (ALTN 3)
PLAN, 241-AN-103

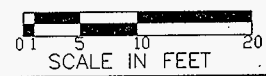
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Sheet 5 of 5
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PLAN
TANK, 241-AN-104

HNF-2500
Revision 0

H-41/H-42

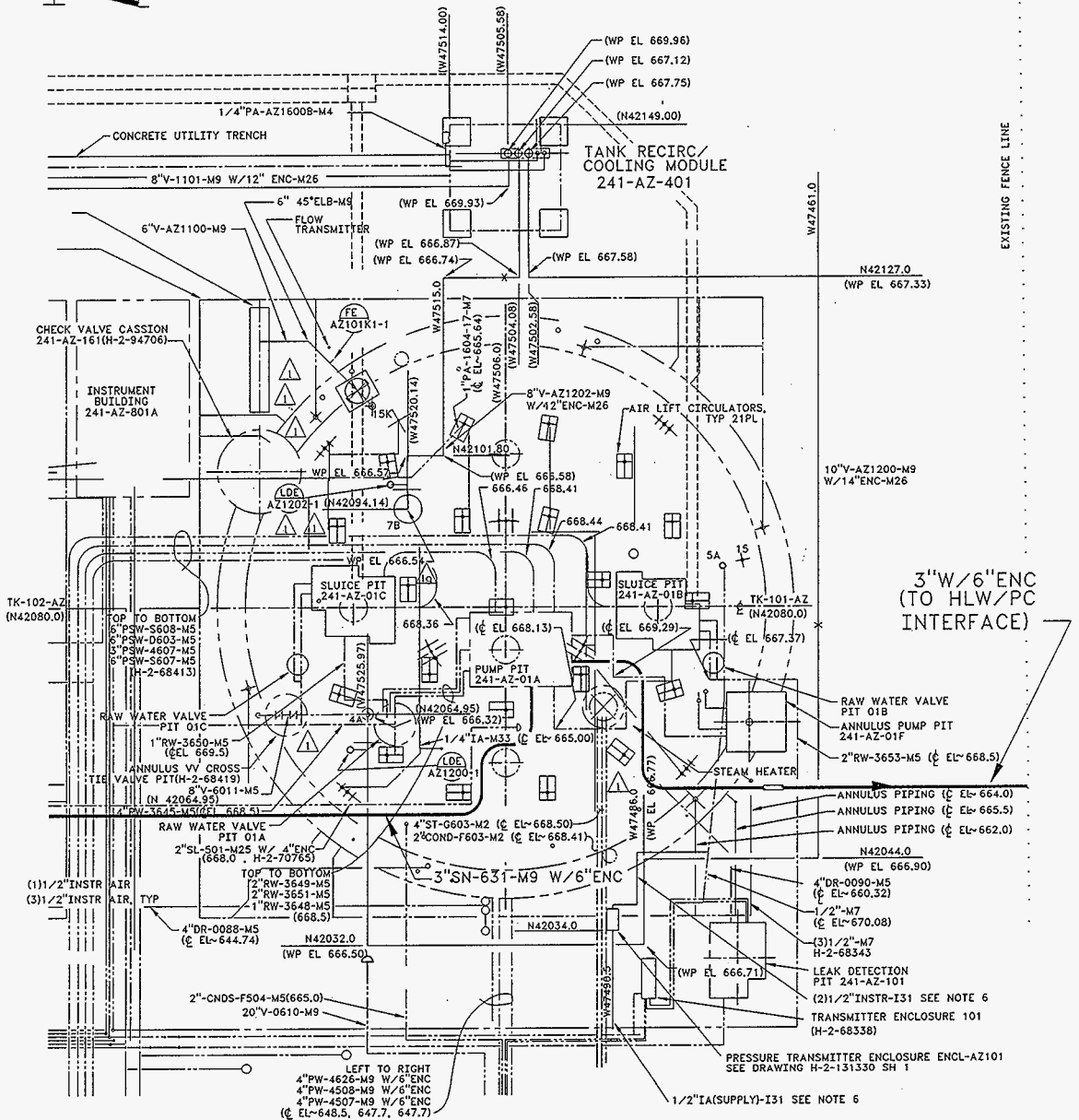
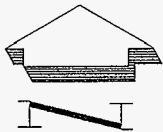


FEED DELIVERY CONCEPTUAL DESIGN

Prepared by: Wm ZECKUHR
Reviewed by: FLUOR DANIEL NORTHWEST

PIPING (ALTN 7&7B)
PLAN, 241-AN-104

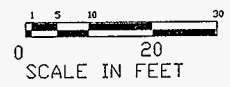
Sketch no. ES-FD-P5
Date 4/17/98
Sheet 5 of 5
ANTOP



PLAN
TANK, 241-AZ-101

HNF-2500
Revision 0

H-43/H-44



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
Wm ZICKUHR
Reviewed by:



PIPING (ALTN 3&7)
PLAN, 241-AZ-101

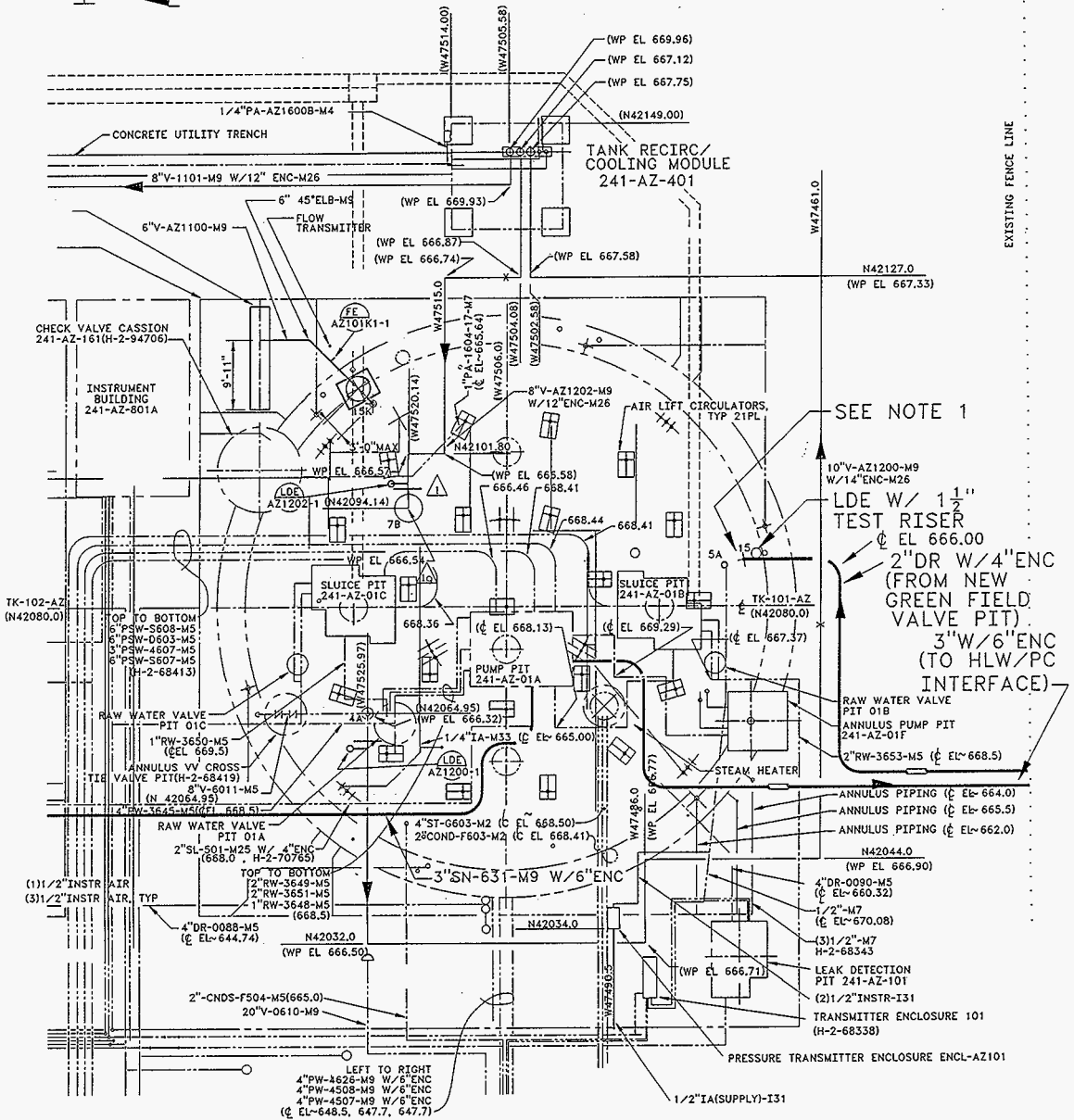
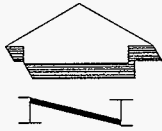
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ES-FD-P6

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AZ101	0

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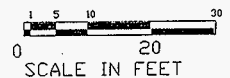
1. CUT AND REMOVE RISER FLANGE (ABOVE 665.00'). INSTALL 6" MECHANICAL COUPLING ADAPTER (ROMAC INDUSTRIES #FCA501-6.91). INSTALL 6" BLIND FLANGE WITH 2"Ø DRAIN, 1' LONG, THRU. 4"Ø ENCASEMENT TO END AT BLIND FLANGE. APPLY SHRINK WRAP PROTECTION (RAYCHEM, FLANGE SEAL #FS12750) ABOUT MECHANICAL ADAPTER AND FLANGE.



**PLAN
TANK, 241-AZ-101**

HNF-2500
Revision 0

H-45/H-46



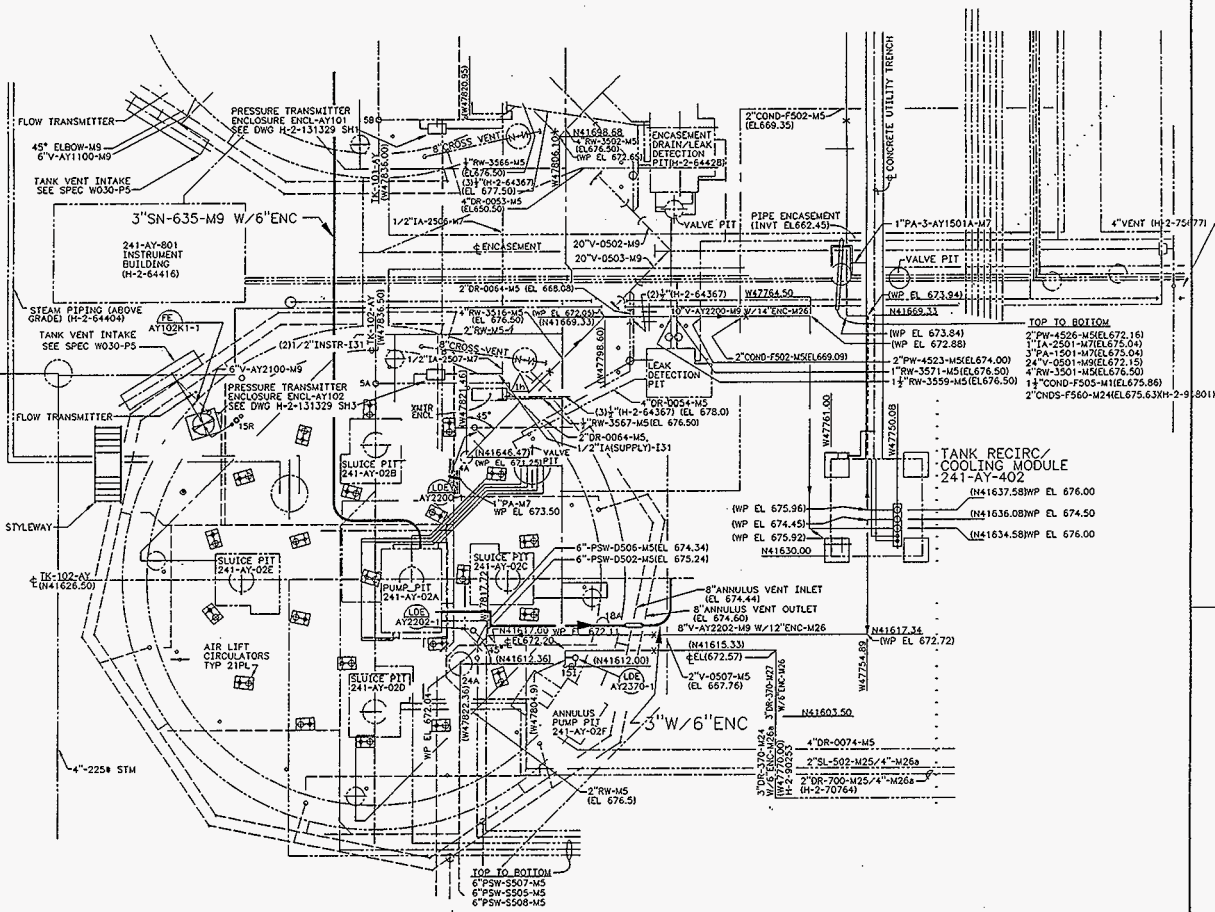
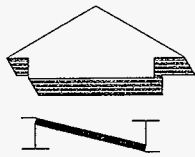
FEED DELIVERY CONCEPTUAL DESIGN

Prepared by: **Wm ZICKHR**
Reviewed by: **FLUOR DANIEL NORTHWEST**

PIPING (ALTN 7B)
PLAN, 241-AZ-101

Sketch no. **ES-FD-P7**

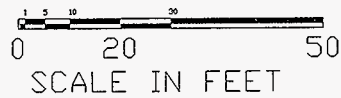
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1	Rev	0
AZ101		



**PLAN
TANK, 241-AY-102**

HNF-2500
Revision 0

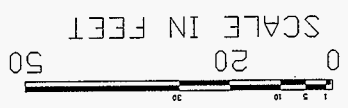
H-47/H-48



FEED DELIVERY CONCEPTUAL DESIGN

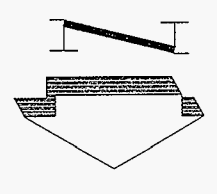
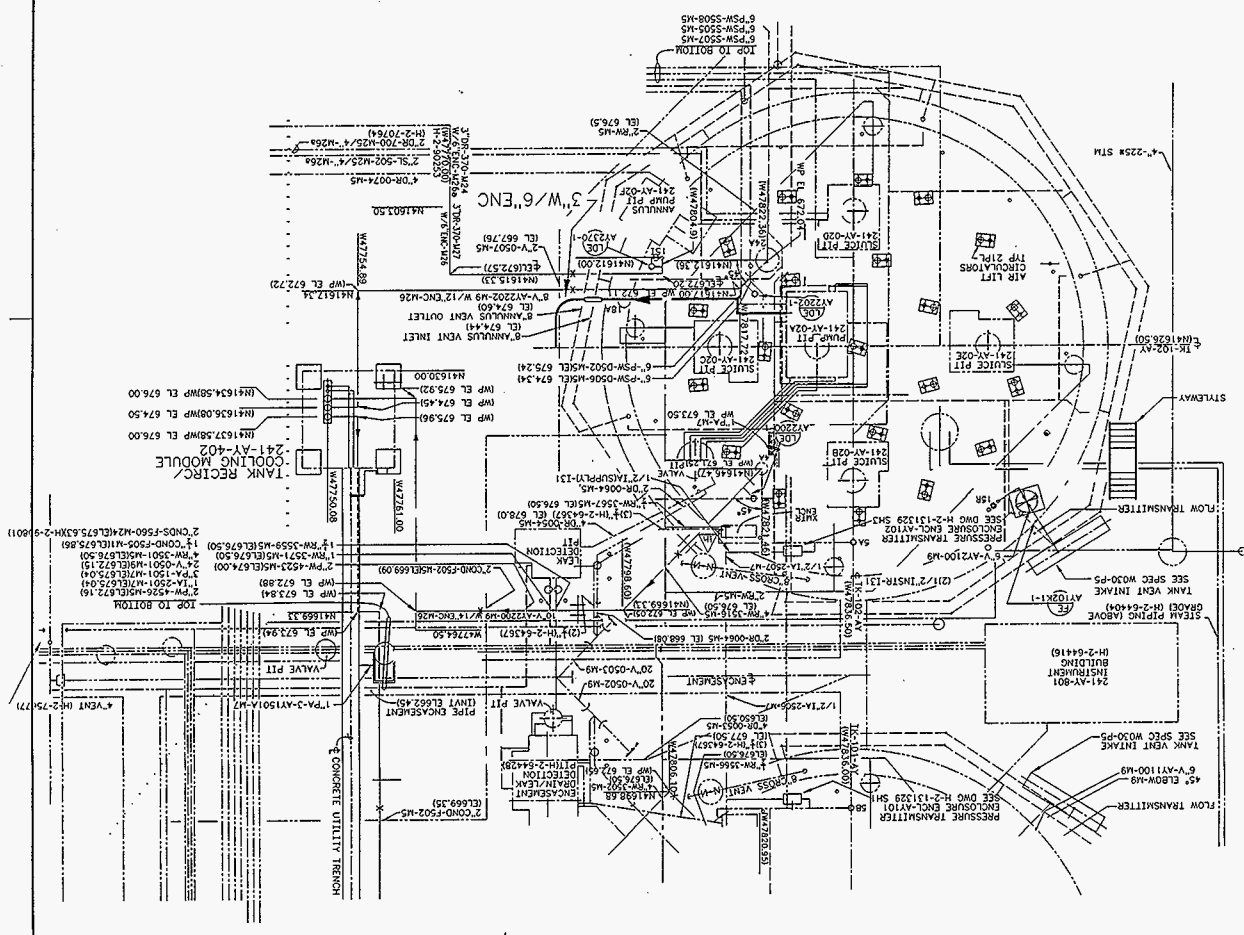
Prepared by: Wm ZICKUHR		PIPING (ALTN 3&7) PLAN, 241-AY-102	Sketch no. ES-FD-P8	Date 07/17/98	Sheet 5
Reviewed by:				AY102P	0

FEED DELIVERY CONCEPTUAL DESIGN



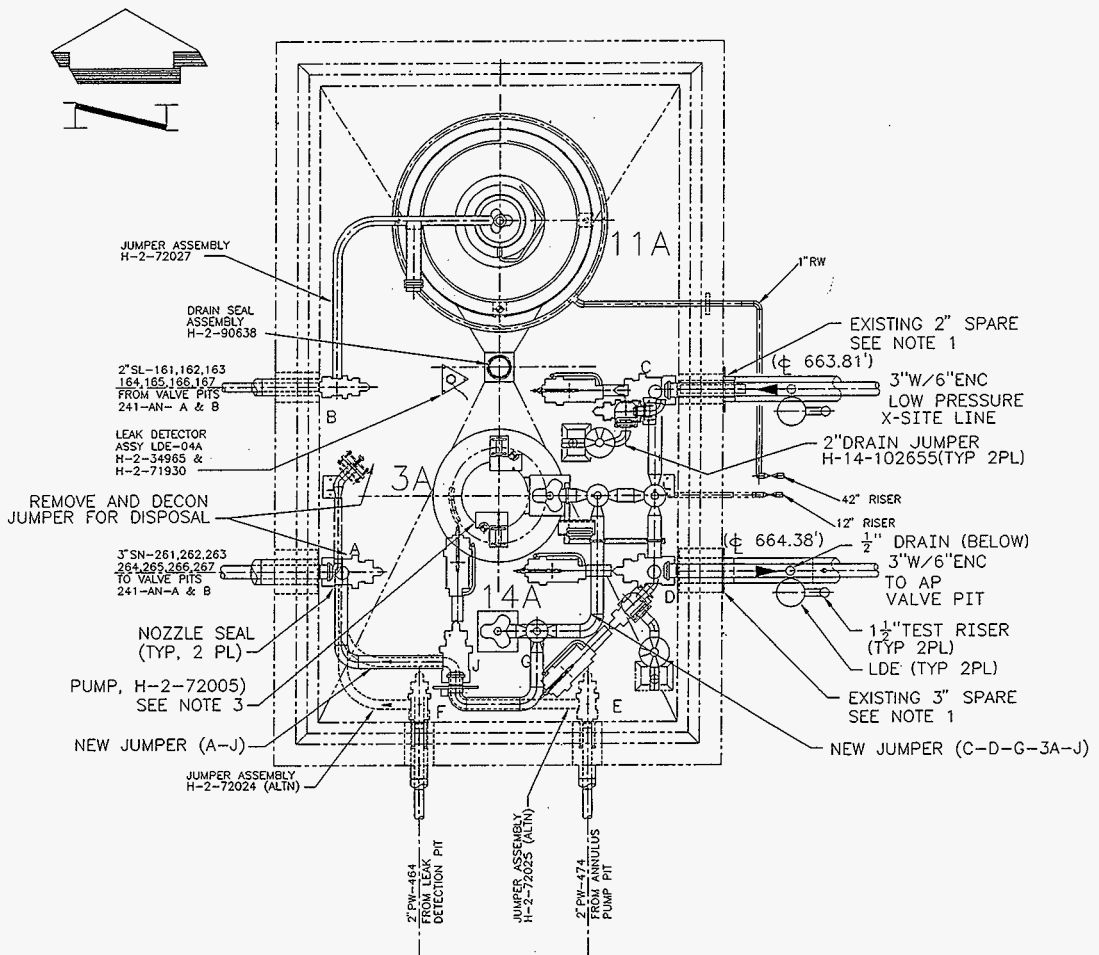
HNF-2500
Revision 0
H-49/H-50

PLAN
TANK, 241-AY-102



NOTES:

1. CUT AND REMOVE CAP AND ATTACH NEW 3"W/6" ENC. ATTACH 1 1/2" ENC DRAIN TO EXISTING PENETRATION. ATTACH 1 1/2" DR, SUPPORT, AND 2" NOZZLE.
2. DRAIN VALVES SHALL HAVE VALVE HANDLE ASSEMBLIES, SEE H-14-100972.
3. PUMP ASSEMBLY NEEDS TO BE REORIENTATED 180° FOR THIS ARRANGEMENT.
4. PROCESS VALVES SHALL HAVE ACTUATOR ASSEMBLIES, SEE H-2-100976.



PLAN
PUMP PIT, 241-AN-01A

NEW COVER BLOCK (28" THICK)
COVER SHALL HAVE PIT SPRAY (H-2-72030)
(COVER BLOCK REMOVED FOR CLARITY)

HNF-2500
Revision 0

H-51/H-52



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
Wm ZICKUHR
Reviewed by:



JUMPER ARRANGEMENT (ALTN 7&7B)
PUMP PIT, 241-AN-01A

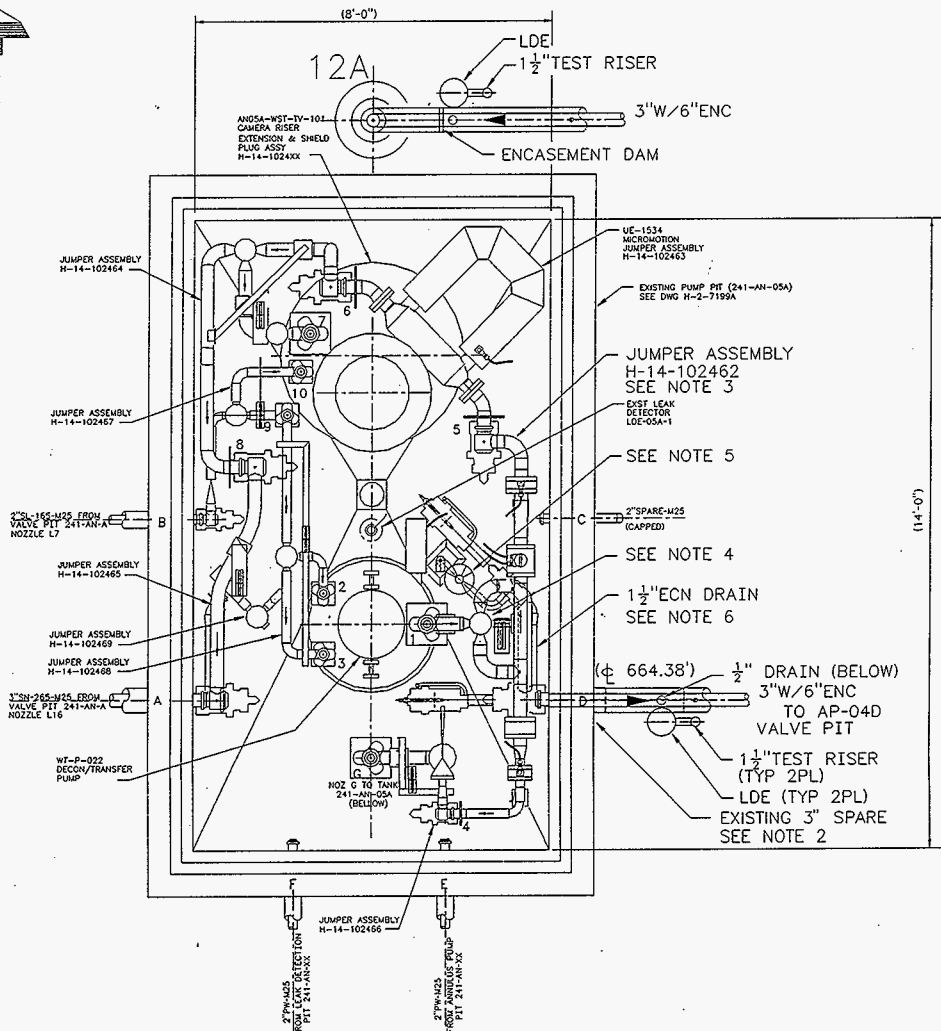
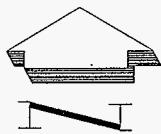
Sketch no.

ES-FD-P10

Date	4/17/98	Sheet	5
SN	1	REV	0
ANOTA			

NOTES:

1. THE EXISTING ARRANGEMENT USED FOR THIS STUDY WAS BASED ON PROJECT W-211s LAYOUT OF 241-AN-05A (04A WAS NOT AVAILABLE IN TIME FOR THIS STUDY).
2. CUT AND REMOVE CAP AND ATTACH NEW 3"W/6" ENC. ATTACH 1½"ENC DRAIN TO EXISTING PENETRATION.
3. EXISTING JUMPER, H-14-102464, WILL REQUIRE A NEW 3-WAY VALVE AND A NEW LEG TO NOZZLE 'D'.
4. PROCESS VALVES SHALL HAVE ACTUATOR ASSEMBLIES, SEE H-2-100976.
5. DRAIN VALVES SHALL HAVE VALVE HANDLE ASSEMBLIES, SEE H-14-100972.
6. ATTACH 1½"DR, SUPPORT, AND 2" NOZZLE (INSIDE OF PIT), SIMILAR TO 2" DRAIN AT NOZZLE 'A'.

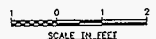


PLAN
PUMP PIT, 241-AN-04A

NEW COVER BLOCK (28" THICK)
COVER SHALL HAVE PIT SPRAY (H-2-72030)
(COVER BLOCK REMOVED FOR CLARITY)

HNF-2500
Revision 0

H-53/H-54



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
Wm ZICKUHR
Reviewed by:



JUMPER ARRANGEMENT (ALTN 7&7B)
PUMP PIT, 241-AN-04A

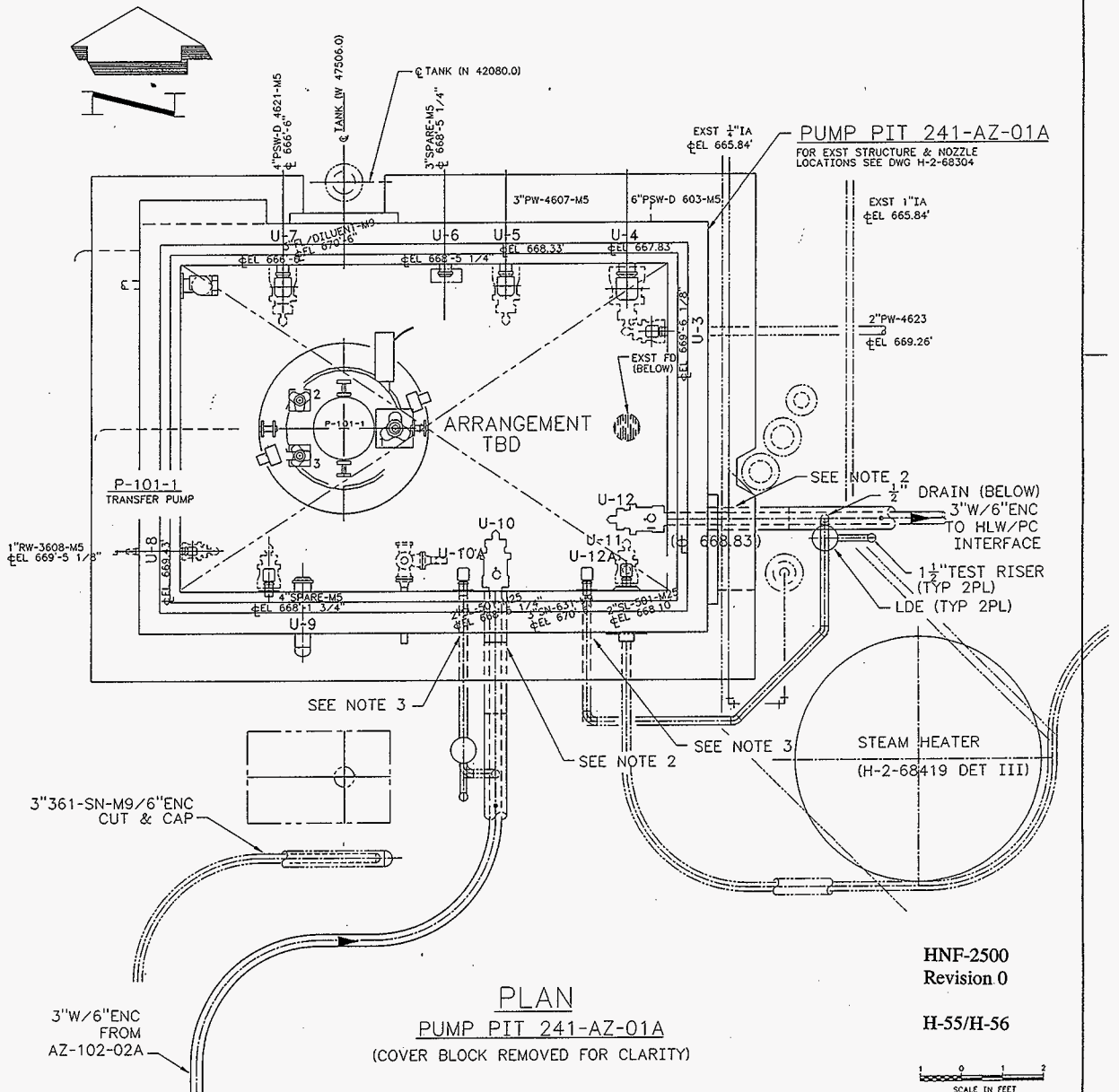
Sketch no.

ES-FD-P11

DATE	17/98	ISSUE	5
NO.	1	REV.	0
AN04A			

NOTES:

1. DRAIN VALVES SHALL HAVE VALVE HANDLE ASSEMBLIES, SEE H-14-100972.
2. CUT AND CORE DRILL (6") AND INSTALL NEW 3" NOZZLE (U12). ATTACH NEW 3"W/6" ENC.
3. CUT AND CORE DRILL (3") AND INSTALL NEW 2" NOZZLE (U12A). ATTACH NEW 2" ENC DRAIN AND ROUTE IN APPROXIMATE LOCATION SHOWN.
4. PROCESS VALVES SHALL HAVE ACTUATOR ASSEMBLIES, SEE H-2-100976.

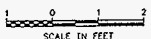


PLAN

PUMP PIT 241-AZ-01A
(COVER BLOCK REMOVED FOR CLARITY)

HNF-2500
Revision 0

H-55/H-56



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
Wm ZICKUHR
Reviewed by:



JUMPER ARRANGEMENT (ALTN 3&7)
PUMP PIT, 241-AZ-01A

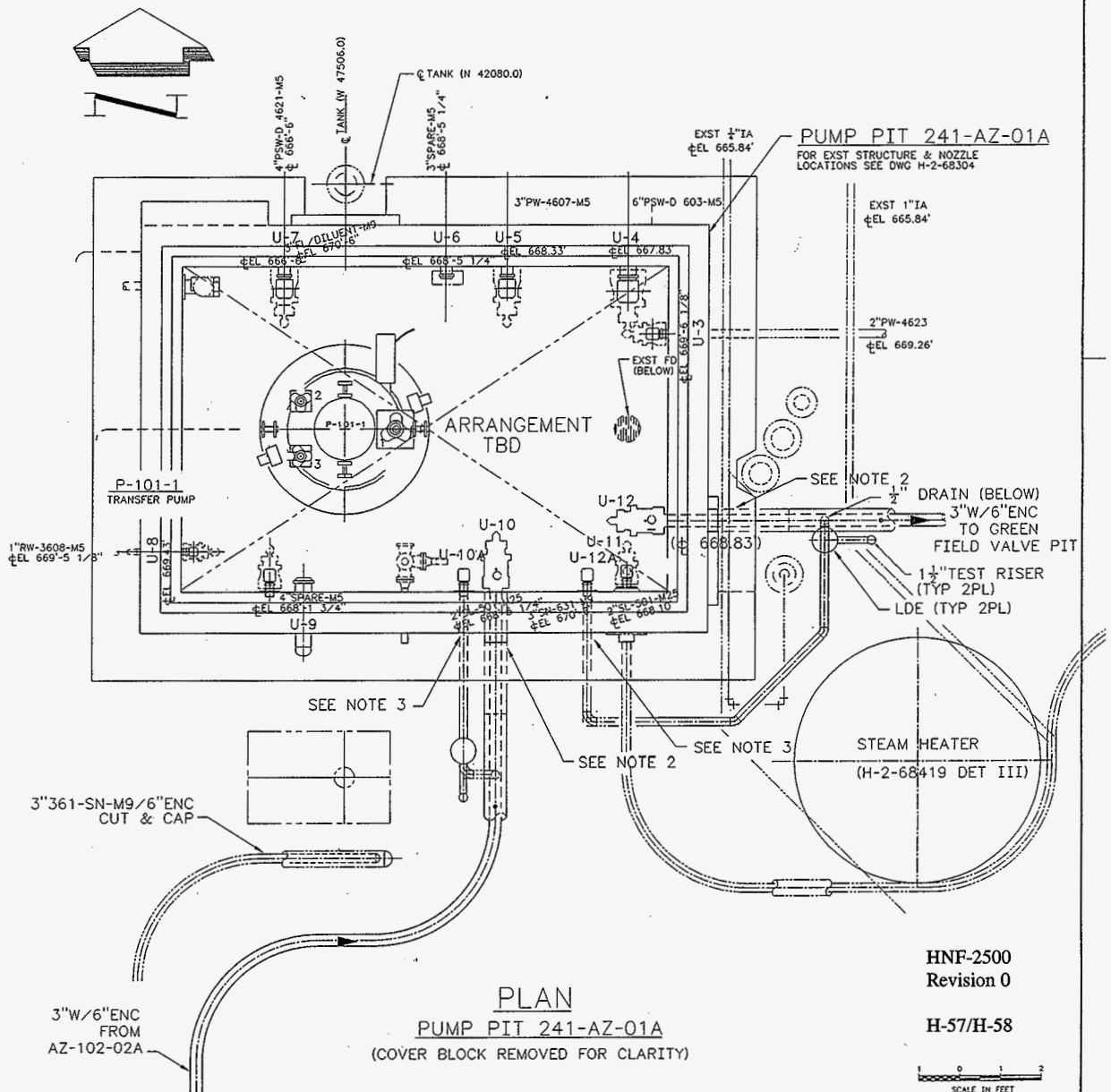
Sketch no.

ES-FD-P12

04/17/98	Draw
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AZ01A	0

NOTES:

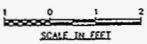
1. DRAIN VALVES SHALL HAVE VALVE HANDLE ASSEMBLIES, SEE H-14-100972.
2. CUT AND CORE DRILL (6") AND INSTALL NEW 3" NOZZLE (U12). ATTACH NEW 3"W/6" ENC.
3. CUT AND CORE DRILL (3") AND INSTALL NEW 2" NOZZLE (U12A). ATTACH NEW 2" ENC DRAIN AND ROUTE IN APPROXIMATE LOCATION SHOWN.
4. PROCESS VALVES SHALL HAVE ACTUATOR ASSEMBLIES, SEE H-2-100976.



PLAN
PUMP PIT 241-AZ-01A
 (COVER BLOCK REMOVED FOR CLARITY)

HNF-2500
 Revision 0

H-57/H-58



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
 Wm ZICKUHR
 Reviewed by:

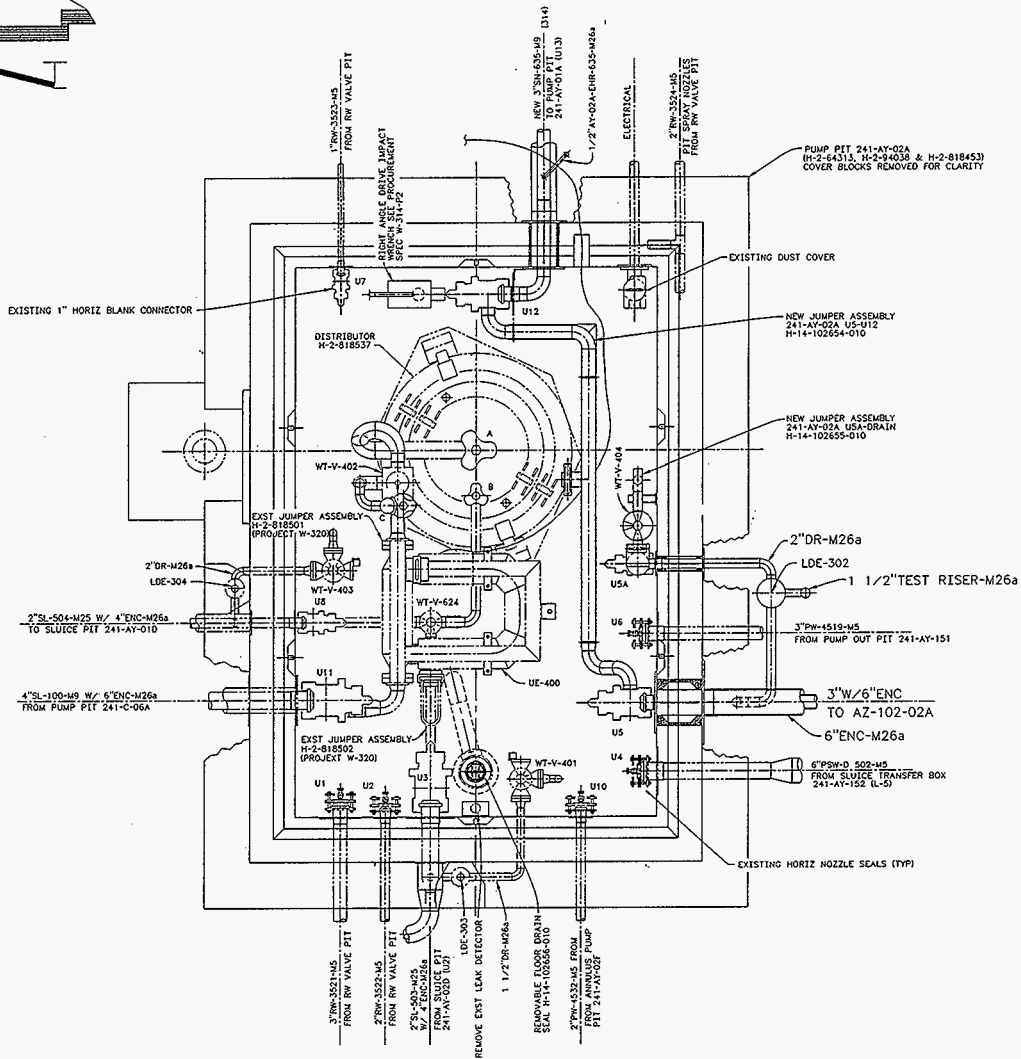
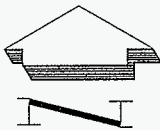


JUMPER ARRANGEMENT (ALTN 7B)
 PUMP PIT, 241-AZ-01A

Sketch no.

ES-FD-P13

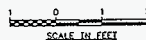
04/17/98	5
Sn 1	REV 0
AZ01A	



PLAN
VALVE PIT, 241-AY-02A
 (COVER BLOCK REMOVED FOR CLARITY)

HNF-2500
Revision 0

H-59/H-60



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
Wm ZICKUHR
Reviewed by:

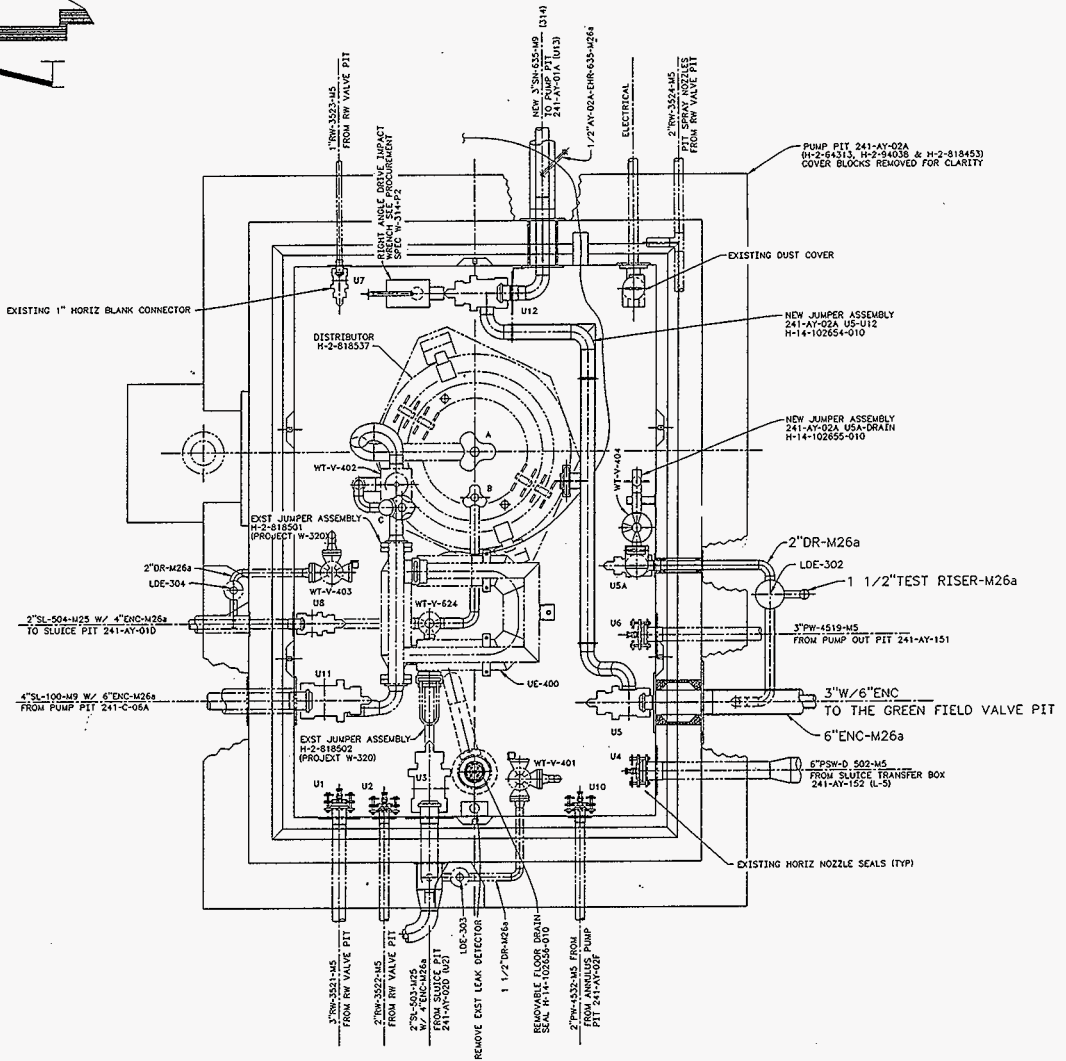
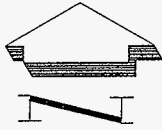


JUMPER ARRANGMENT (ALTN 3&7)
 PUMP PIT, 241-AY-02A

Sketch no.

ES-FD-P14

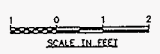
DATE	17/98	ISSUE	5
BY	I.	REV	0
AY02A			



PLAN
VALVE PIT, 241-AY-02A
 (COVER BLOCK REMOVED FOR CLARITY)

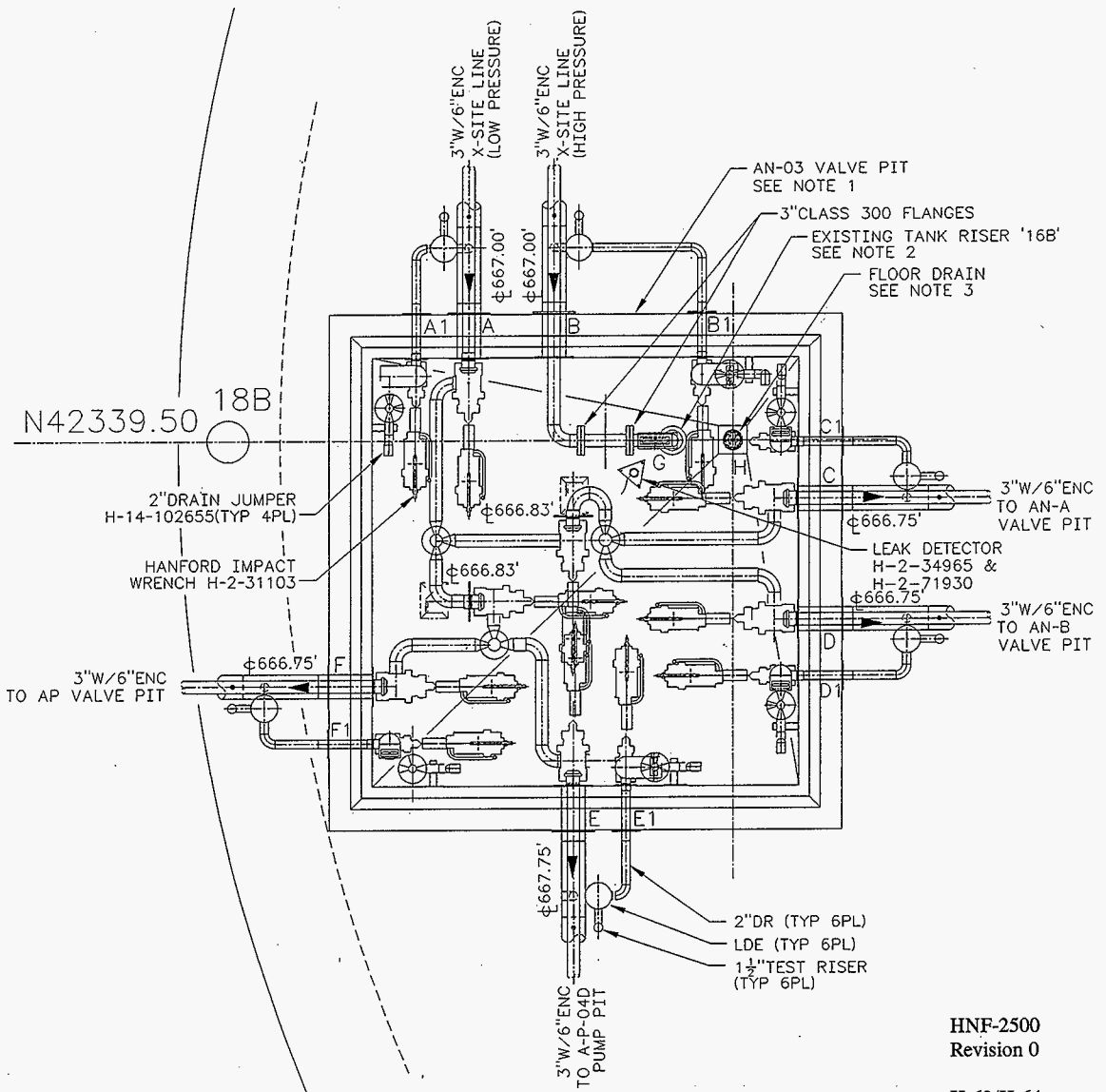
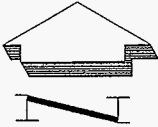
HNF-2500
Revision 0

H-61/H-62



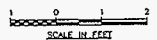
NOTES:

1. NEW VALVE PIT , 12'x12' (OUTSIDE) WITH 1' WALLS, AND 28" THICK COVER BLOCKS.
2. RELOCATE EXISTING 'PI' FROM RISER '16B' TO OTHER 4" SPARE RISER. CUT RISER 16B AND APPLY 4" CLASS 300 FLANGE WITH 3" SCHED 40S DIP TUBE TO TANK DOME SPACE (8' LONG).
3. FLOOR DRAIN SHALL SLOPE AND DRAIN TO RISER '16B'. THERE SHALL BE A REMOVABLE FLOOR DRAIN SEAL, SEE H-14-10097).
4. PROCESS VALVES SHALL HAVE ACTUATOR ASSEMBLIES, SEE H-2-100976.
5. DRAIN VALVES SHALL HAVE VALVE HANDLE ASSEMBLIES, SEE H-14-100972.



PLAN
VALVE PIT, 241-AN-103
 (COVER BLOCK REMOVED FOR CLARITY)

HNF-2500
 Revision 0
 H-63/H-64



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
 Wm ZICKUHR
 Reviewed by:



JUMPER ARRANGEMENT (ALTN 3)
 VALVE PIT, 241-AN-103

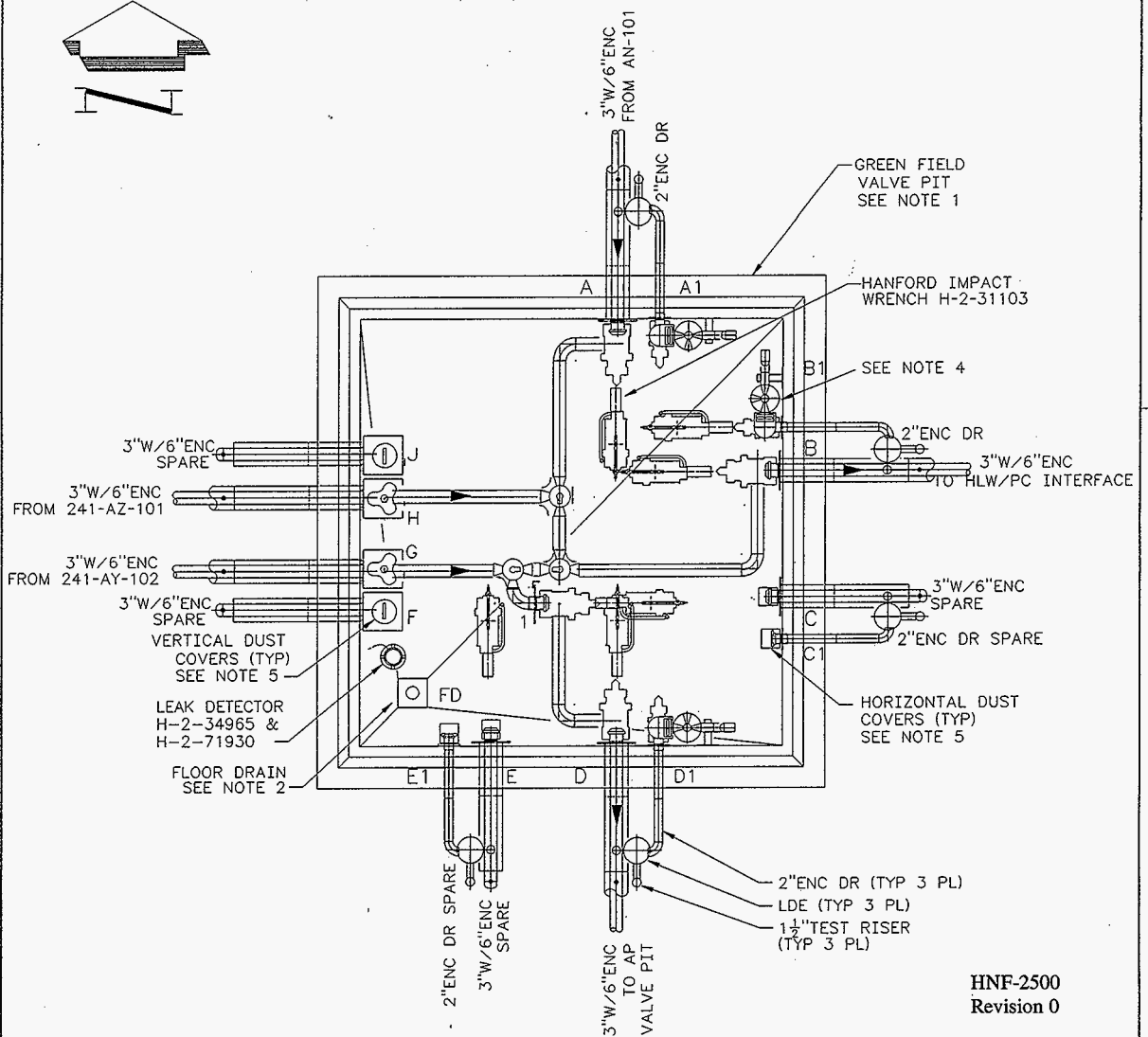
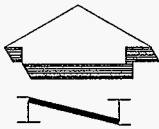
Sketch no.

ES-FD-P16

DATE	17/98	Draw	5
SN	1	Rev	0
ANOJVP			

NOTES:

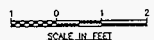
1. NEW VALVE PIT , 12'x12' (OUTSIDE) WITH 1' WALLS, AND 28" THICK COVER BLOCKS.
2. FLOOR DRAIN SHALL SLOPE AND DRAIN TO RISER 'X' ON 241-AZ-101 THERE SHALL BE 'A' REMOVABLE FLOOR DRAIN SEAL, SEE H-14-10097).
3. PROCESS VALVES SHALL HAVE ACTUATOR ASSEMBLIES, SEE H-2-100976.
4. DRAIN VALVES SHALL HAVE VALVE HANDLE ASSEMBLIES, SEE H-14-100972.
5. HORIZONTAL AND VERTICAL DUST COVERS SHOWN IN ARRANGEMENT ARE TO BE SUPPLIED, AS REQUIRED BY CUSTOMER.



HNF-2500
Revision 0

H-65/H-66

PLAN
NEW GREEN FIELD VALVE PIT
(COVER BLOCK REMOVED FOR CLARITY)



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
Wm ZICKUHR
Reviewed by:



JUMPER ARRANGEMENT (ALTN 7B)
NEW GREEN FIELD VALVE PIT

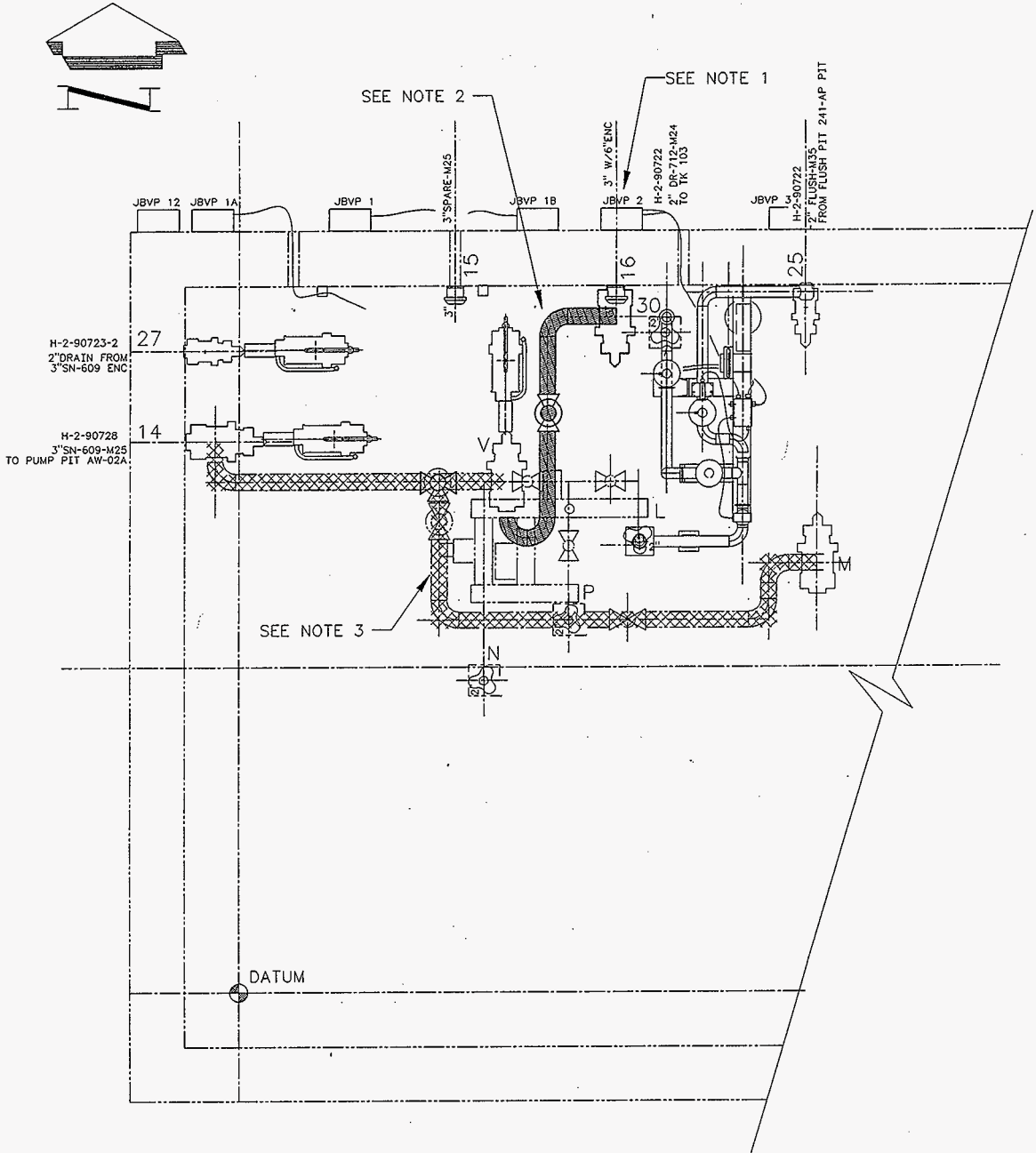
Sheet no.

ES-FD-P17

4/17/98	5
1	5
AZVPIT	0

NOTES:

1. CUT AND REMOVE CAP AND ATTACH NEW 3"W/6"ENC.
2. NEW JUMPER CONSIST OF A 3" HORIZONTAL CONNECTOR, AT NOZZLE '16'. 3" SCHED 40 PIPE ENDING AT A NEW 3" MALE NOZZLE ('V'), WITH SINGLE (PBM) BALL VALVE.
3. REPLACE JUMPER 14-M-(P) WITH NEW JUMPER: SAME CONFIGURATION 14-M-V-(P) WITH A NEW HORIZONTAL CONNECTOR (V), NEW 3" 3-WAY (PBM) BALL VALVE, OPERATOR ABOVE COVER BLOCK (H-14-102464).



PLAN
VALVE PIT, 241-AP
 (COVER BLOCK REMOVED FOR CLARITY)

HNF-2500
 Revision 0

H-67/H-68



FEED DELIVERY CONCEPTUAL DESIGN

Prepared by:
 Wm ZICKUHR
 Reviewed by:



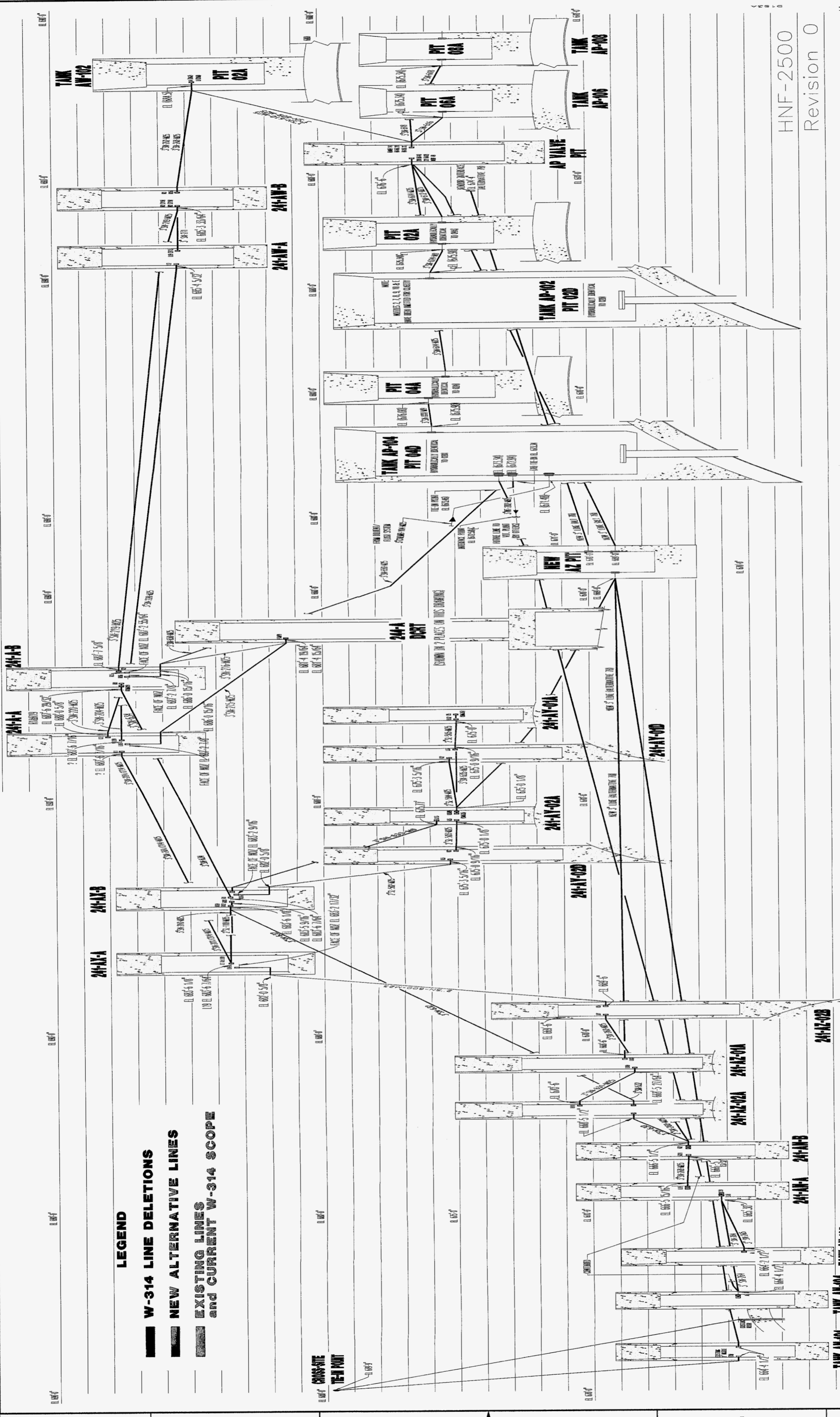
JUMPER ARRANGEMENT (ALTN 3,7,&7B)
 VALVE PIT, 241-AP

Sketch no.

ES-FD-P18

04/17/98	1/24
SN 1	5
APVP	0

- LEGEND**
-  **W-314 LINE DELETIONS**
 -  **NEW ALTERNATIVE LINES**
 -  **EXISTING LINES and CURRENT W-314 SCOPE**



HNF-2500
Revision 0

**QUESTIONS OR COMMENTS:
IVAN PAPP 372-0940**

U.S. DEPARTMENT OF ENERGY FLUOR DANIEL NORTHWEST, INC. ELEVATIONS VIEW OF TRANSFER ROUTES TANK FARMS		PROJECT NO. W-314 DRAWING NO. 372-0940 SCALE: SHOWN DATE: 11/18/93
REVISIONS NO. DATE DESCRIPTION 1 11/18/93 ELEC. PWR. & CONTROL PLANS 2 11/18/93 ELEC. PWR. & CONTROL PLANS 3 11/18/93 ELEC. PWR. & CONTROL PLANS 4 11/18/93 ELEC. PWR. & CONTROL PLANS 5 11/18/93 ELEC. PWR. & CONTROL PLANS	REVISIONS NO. DATE DESCRIPTION 1 11/18/93 ELEC. PWR. & CONTROL PLANS 2 11/18/93 ELEC. PWR. & CONTROL PLANS 3 11/18/93 ELEC. PWR. & CONTROL PLANS 4 11/18/93 ELEC. PWR. & CONTROL PLANS 5 11/18/93 ELEC. PWR. & CONTROL PLANS	CADFILE: D153A CADCODE: WIN95:AC02:12.0:SS
DWG NO. H-14-100929 DRAWING TRACEABILITY LIST	TITLE ELEVATIONS VIEW OF TRANSFER ROUTES TANK FARMS	REF. NO. H-2-71925 REF. NUMBER
NEXT USED ON	REFERENCES	TITLE ELEVATIONS VIEW OF TRANSFER ROUTES TANK FARMS
2 PLOT SCALE: 1"=10'	3	4
5	6	7
8	9	10

029-13

DISTRIBUTION SHEET

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Distribution	I. G. Papp, NHC	Date 4/28/98
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W-314 Waste Transfer Alternative Piping System Description, HNF-2500, Rev. 0		ECN No.

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