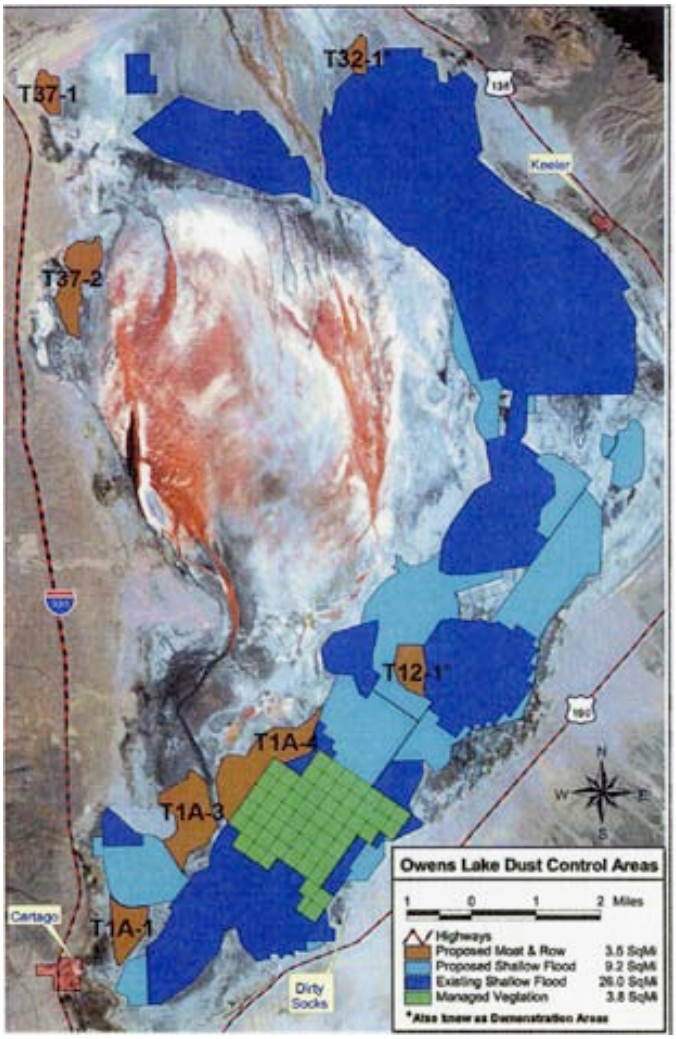
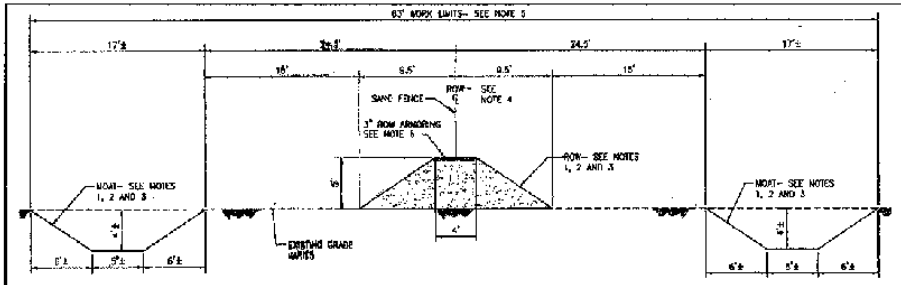
MOAT AND ROW OPTIONS ANALYSIS
February 9, 2010

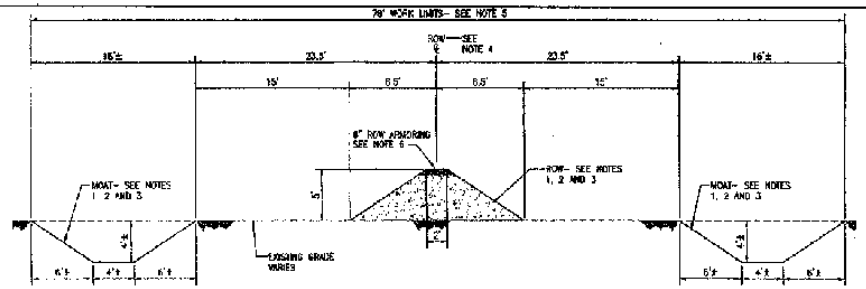
The purpose of this options analysis is to explore alternatives for the seven Phase VII Moat and Row dust control areas, including non-traditional dust control methods, that could potentially be implemented to modify or replace Moat and Row as currently proposed. These options are preliminary and will require additional investigation prior to implementation including compliance with the California Environmental Quality Act (CEQA), engineering analysis and design, and pilot testing in some cases to determine technical feasibility and dust control performance. The Phase VII areas to be controlled are shown in brown and labeled on the figure below.

As a baseline from which to develop alternate dust control strategies, the Los Angeles Department of Water and Power (LADWP) has developed a new Moat and Row cross section design that essentially eliminates the moats and associated concerns related to entrapment of birds. The nature of this cross section change is such that it should not require additional CEQA analysis prior to implementation. This provides an opportunity to remain in regulatory compliance while completing the approval process for the site alternatives.

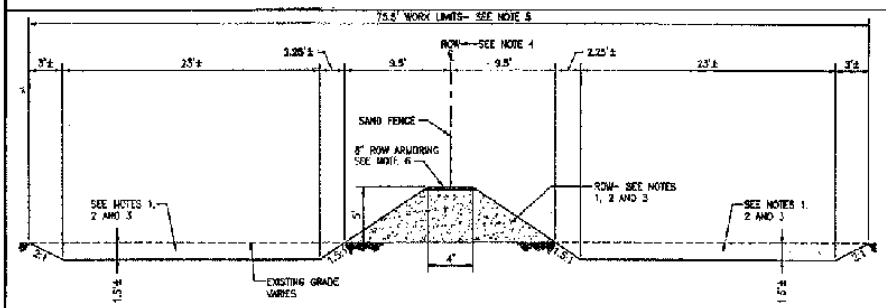




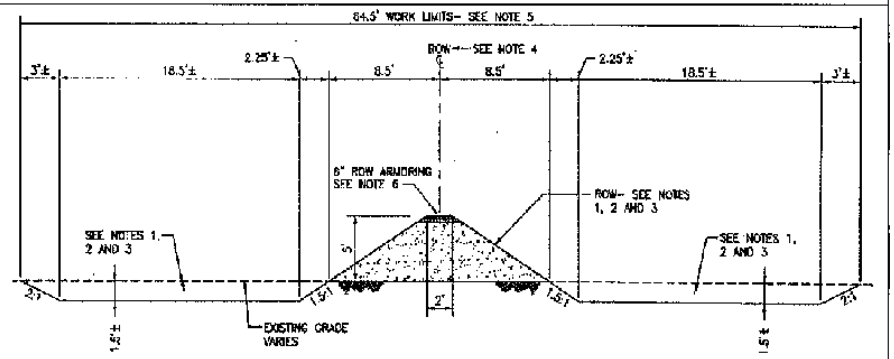
Original Moat and Row cross section with fence
disturbed width = 83 feet



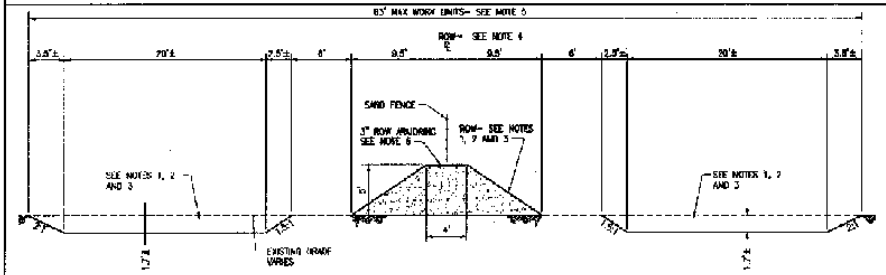
Original Moat and Row cross section without fence
disturbed width = 79 feet



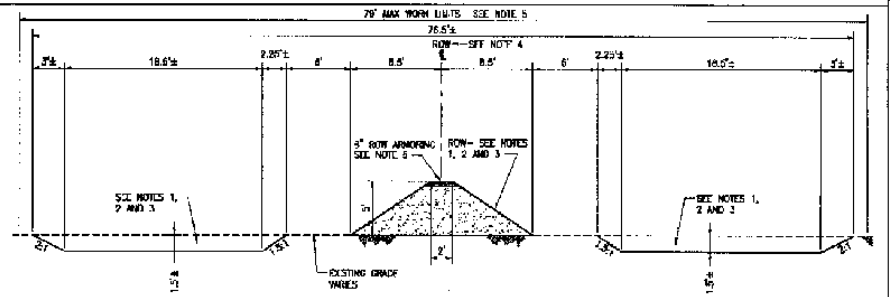
Option A - new moat-less cross section with fence
disturbed width = 75.5 feet



Option A - new moat-less cross section without fence
Disturbed width = 64.5 feet



Option B – new moat-less cross section with fence and ATV access
disturbed width = 83 feet



Option B – new moat-less cross section without fence and ATV access
disturbed width = 79 feet

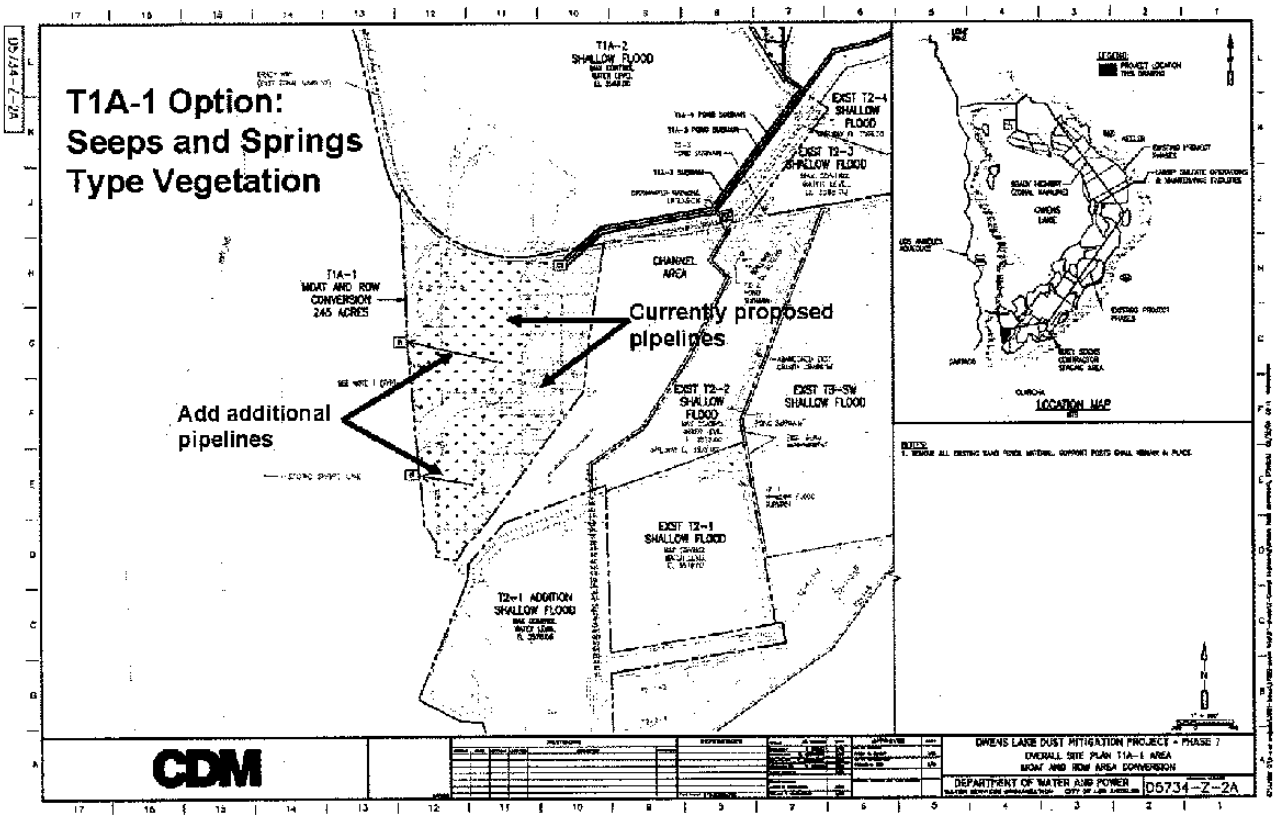
Moat and Row Area T1A-1: 245 acres, Average Minimum Dust Control Efficiency (MDCE) = 31%

Characteristics:

Moat and Row Area T1A-1 is presently under construction and includes 3.8 miles of sand fence only (no moats or rows) with sand fence clements spaced from 623 to 2,149 feet apart. There is also a pipeline designed to enhance vegetation growth within the area.

Options:

1. It may be possible to expand the pipeline network to further develop vegetation growth and seeps and springs type vegetation / habitat eliminating the need for the sand fence, particularly given the low required Minimum Dust Control Efficiency (MDCE).



Associated Considerations and Potential Issues Requiring Further Analysis:

- **Would likely require minimal** (if any) additional CEQA analysis as it requires only minor irrigation system additions.
- Implementation of this option would require approval by the Great Basin Unified Air Pollution Control District (GBUAPCD) as it is not traditional managed vegetation
- Required dust control would likely not be achieved prior to the October 2010 compliance deadline due to time required for vegetation to become established. However, once established and approved by GBUAPCD, the fence could be removed.
- Additional water requirements would need to be offset elsewhere.

Moat and Row Area T1A-3: 503 acres, Average MDCE = 89%

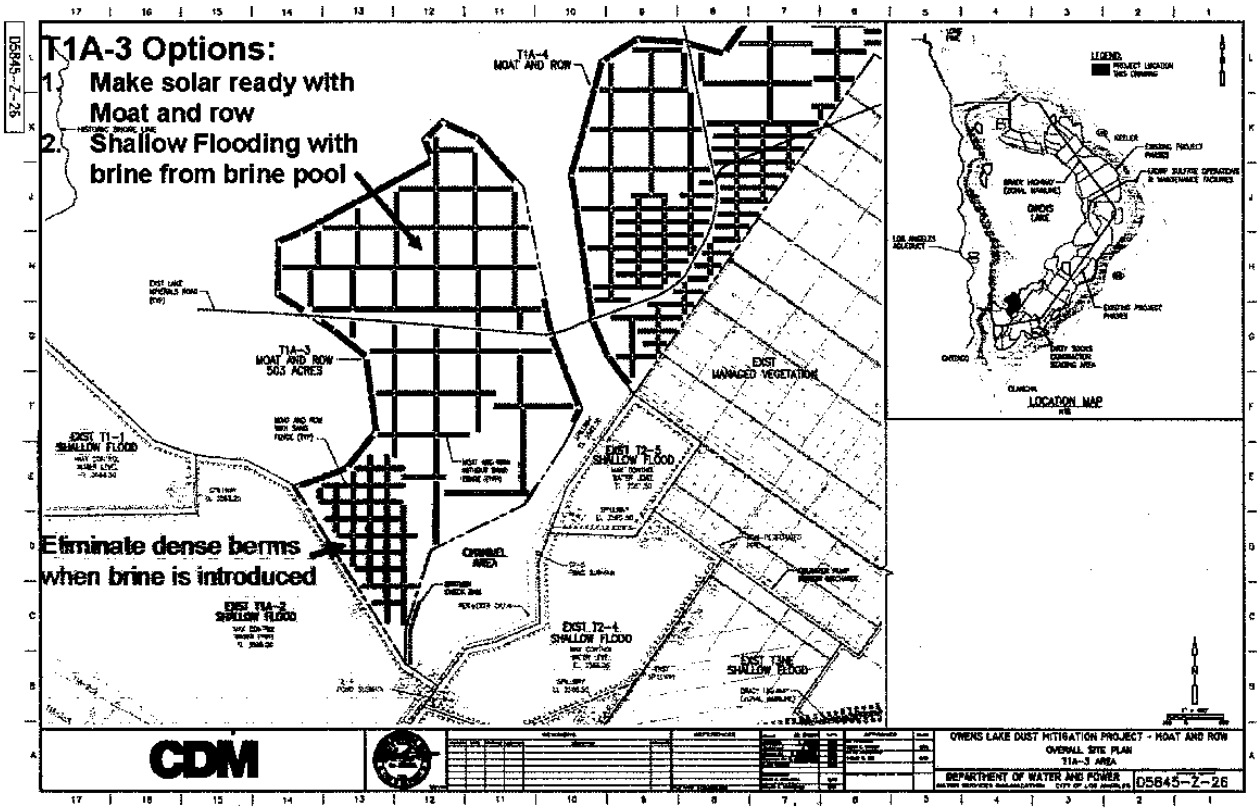
Characteristics:

Currently proposed to have 13 miles of Moat and Row, 2.9 miles of which includes sand fence. Moat and Row elements are spaced from 266 to 663 feet apart. Except for a small area in the southern portion, vegetation growth is not feasible due to poor soil and drainage conditions. The area where vegetation might be possible would require considerable grading to establish proper drainage.

Options:

1. Moat and Row berms with the new moat-less cross section could help make this area "solar ready" while providing interim dust control.

2. Shallow Flooding served by brine from the nearby brine pool. This option would involve construction of shallow flooding facilities consisting of perimeter containment berms and interior terraced berms. If Moat and Row berms are present, they could be converted to terraced shallow flood berms by grading the top of the berms back into the brine ponds. Brine supply options might include dredging a channel from the brine pool to T1A-3 where it would then be pumped via a stationary pumping station to interior cells. Alternatively, a floating pumping station (on a barge in the brine pool) could be used in conjunction with an above-ground flexible pipe to convey brine to the shallow flooding ponds. It may also be possible to transport dry or semi-dry salts for placement into the ponds which would then be mixed with fresh water to achieve the correct salinity. An advantage to the use of brine is reduced evaporation reducing the overall water needed to maintain shallow flooding compliance.



Associated Considerations and Potential Issues Requiring Further Analysis:

- Ultimate water demand would need to be determined based on reduced evaporation, but also infiltration. Any additional water demand would need to be offset elsewhere.
- Implementation of brine would require substantial grading to flatten pond bottoms, well beyond the 33% allowed in the Moat and Row EIR
- Shallow Flooding with brine will not support habitat (similar in nature to the brine pool)
- If the new moat-less rows are constructed, the associated berms can be converted to shallow flooding berms.
- Considerable engineering will be needed to develop an appropriate brine conveyance system (pumps, pipes, channels etc.). Pilot testing to determine technical feasibility will be required.
- The brine pool is considered a federal waterway, and transferring it from one location on the lake bed to another would need to be explored from a permitting perspective.
- The above factors would require additional CEQA analysis prior to implementation.
- It is unknown how much time would be required to assess technical challenges, permitting issues, and perform required CEQA analysis so implementation would not be possible prior to the October 2010 dust control compliance deadline

Moat and Row Area T1A-4: 616 acres, Average MDCE = 91%

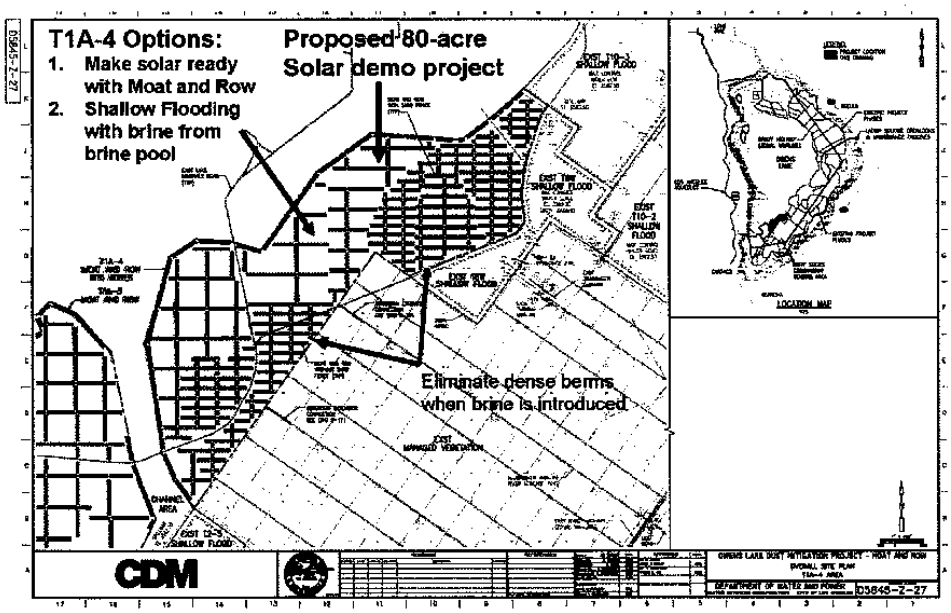
Characteristics:

Currently proposed to have 22.2 miles of Moat and Row, 1.8 miles of which includes sand fence. Moat and Row elements are spaced from 207 to 630 feet apart. Additionally, LADWP has proposed to construct a solar demonstration project on 80-acres within Area T1A-4. US Borax has mining operations located immediately adjacent to this area. Habitat value in this area is very low and vegetation growth is not feasible on most of the site. Vegetation could be implemented on the portion of the site bordering the existing Managed Vegetation site, but an extensive drainage system with associated pump back stations would be required.

Options:

1. Moat and Row berms with the new moat-less cross section. The resulting earthen berms would help make this area "solar ready" by providing windbreaks.

2. Shallow Flooding served by brine from the nearby brine pool. This option would involve construction of shallow flooding facilities consisting of perimeter containment berms and interior terraced berms. If Moat and Row berms are present, they could be converted to serve as terraced brine pond berms by grading the top of the berms back into the brine ponds. Brine supply options might include dredging a channel from the brine pool to T1A-4 where it would then be pumped via a stationary pumping station to interior cells. Alternatively, a floating pumping station (on a barge in the brine pool) could be used in conjunction with an above-ground flexible pipe to convey brine to the ponds. It may also be possible to transport dry or semi-dry salts for placement into the ponds which would then be mixed with fresh water to achieve the correct salinity. Potential impacts to the Borax mining operations would need to be addressed. There may be an opportunity for a mutually beneficial arrangement where brine resulting from mining operations is used in the brine ponds instead of being returned to the brine pool. An advantage to the use of brine is reduced evaporation reducing the overall water needed to maintain shallow flooding compliance.



Associated Considerations and Potential Issues Requiring Further Analysis:

- Ultimate water demand would need to be determined based on reduced evaporation, but also infiltration. Any additional water demand would need to be offset elsewhere.
- Implementation of brine would require substantial grading to flatten pond bottoms, well beyond the 33% allowed in the moat and row EIR
- Shallow Flooding with brine will not support habitat (similar in nature to the brine pool)
- If the new moat-less rows are constructed, the associated berms can be converted to shallow flooding berms.
- Considerable engineering will be needed to develop an appropriate brine conveyance system (pumps, pipes, channels etc.). Pilot testing to determine technical feasibility will be required.
- The brine pool is considered a federal waterway, and transferring it from one location on the lake bed to another would need to be explored from a permitting perspective.
- T1A-4 abuts the Managed Vegetation site, and possible effects / solutions due to close proximity of brine would need to be assessed.
- The above factors would require additional CEQA analysis prior to implementation.
- It is unknown how much time would be required to assess technical challenges, permitting issues, and perform required CEQA analysis so implementation would not be possible prior to the October 2010 dust control compliance deadline
- Coordination with U.S. Borax would be necessary to ensure their operations are not adversely impacted, and pursue opportunities that might enhance both LADWP and U.S. Borax operations (i.e. use of U.S Borax brine and perimeter dewatering channel concepts)

Moat and Row Area T12-1: South Moat and Row Demo site, 220 acres, Average MDCE = 99%

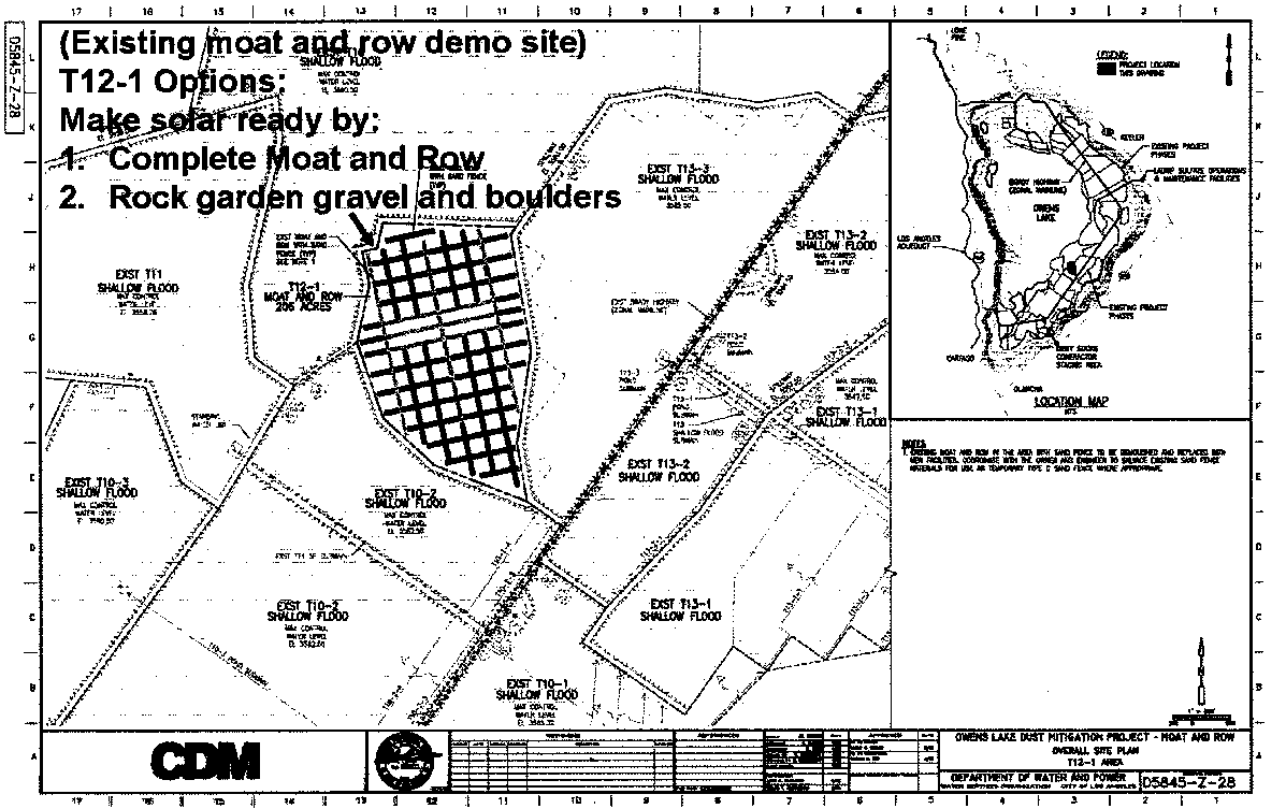
Characteristics:

Currently proposed to have 5.3 miles of Moat and Row, all of which includes sand fence due to the required high MDCE. Moat and Row elements are spaced 320 feet apart. Upon completion of Phase 7 shallow flooding, Area T12-1 will be completely surrounded by ponds. Conditions are not suitable for vegetation growth in this area.

Options:

1. Complete Moat and Row in the planned configuration but with a modified cross section that essentially eliminates the moats. The resulting earthen berms would help make this area "solar ready" by providing earthen wind breaks.

2. Modified gravel BACM (gravel with boulders for more natural look) might also be a feasible alternative in this area.



Associated Considerations and Potential Issues Requiring Further Analysis:

- Additional CEQA analysis would be required for gravel rock garden concept as more than 33% of area would be affected.

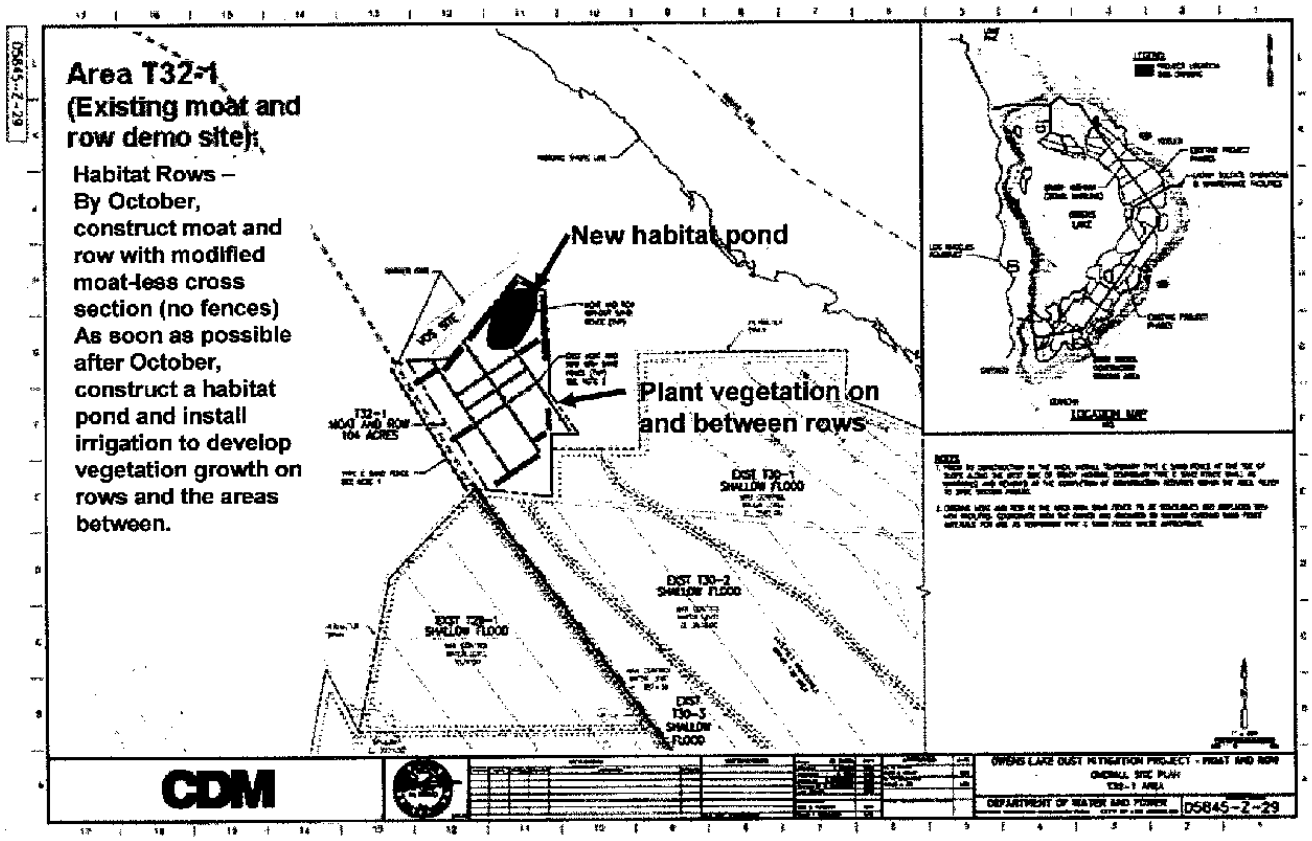
Moat and Row Area T32-1: North Moat and Row Demo site, 104 acres, Average MDCE = 31%

Characteristics:

Currently proposed to have 1.1 miles of Moat and Row. Moat and Row elements are spaced 500 to 1,030 feet apart. Vegetation growth is possible in this area if a water source is provided.

Proposal:

By October 2010, LADWP proposes to construct the rows but with the new modified moat-less cross section. No fences would be used. As soon as possible (upon completion of design, any necessary CEQA, and permitting), LADWP proposes to construct a habitat pond at the north end of Area T32-1, and install an irrigation system to promote native vegetation growth on top of the earthen berms and the areas between them.



Associated Considerations and Potential Issues Requiring Further Analysis:

- Completion of this area in its final form cannot be achieved by October 2010 due to the time required to complete engineering drawings and associated CEQA.
- Need to develop a water source may require offsets elsewhere.

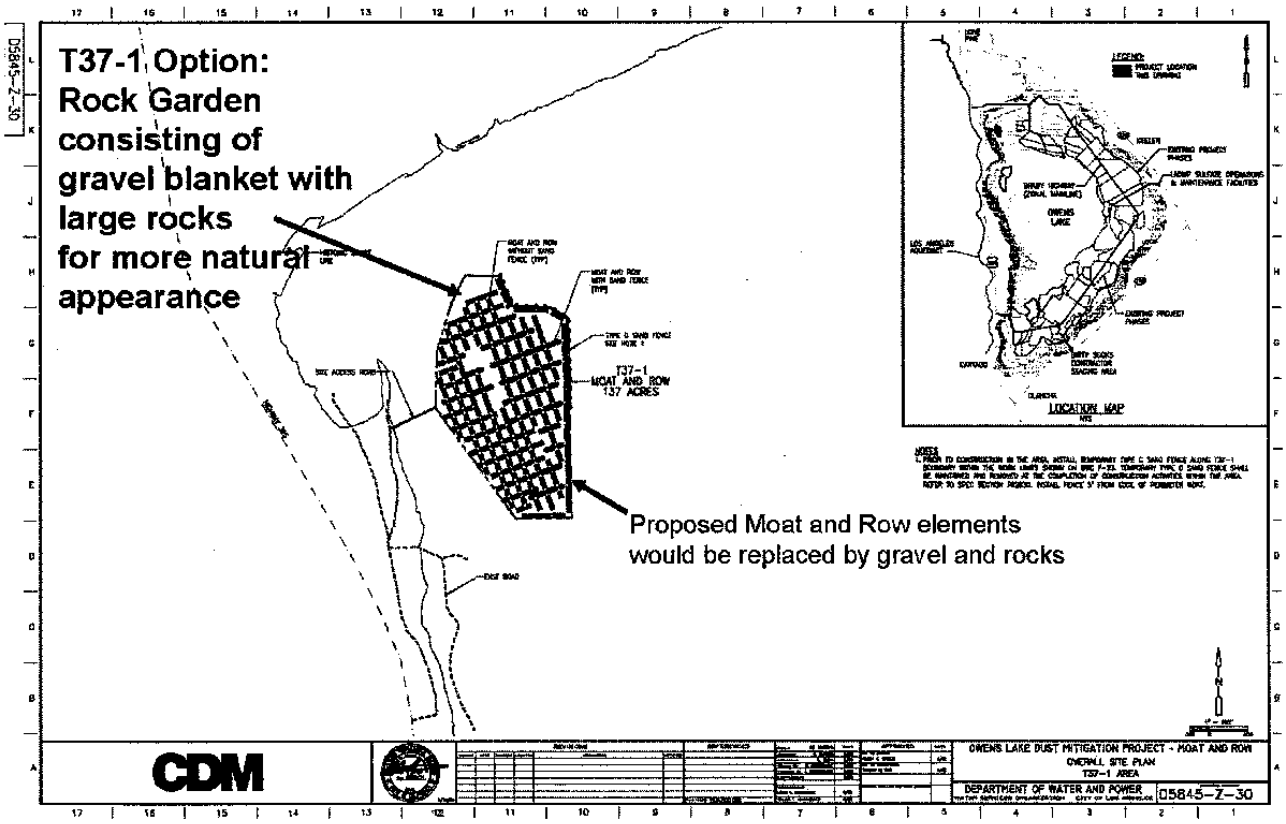
Moat and Row Area T37-1: 137 acres, Average MDCE = 93%

Characteristics:

Currently proposed to have 6.6 miles of Moat and Row, 1.7 miles of which includes sand fence. Moat and Row elements are spaced from 210 to 381 feet apart. Establishment of vegetation in this area would be difficult, and might only be achieved in a small portion of the area provided that a source of water is available. Considerable pipeline would be required to connect to the existing Owens lake distribution system. This area is also a long distance from the brine pool.

Options:

1. Modified gravel BACM (gravel with boulders for more natural look) may be a good alternative in this area, which could also make this area "solar ready".



Associated Considerations and Potential Issues Requiring Further Analysis:

- CEQA analysis would be required as more than 33% of the area would be affected and the October 2010 compliance deadline would not be met.

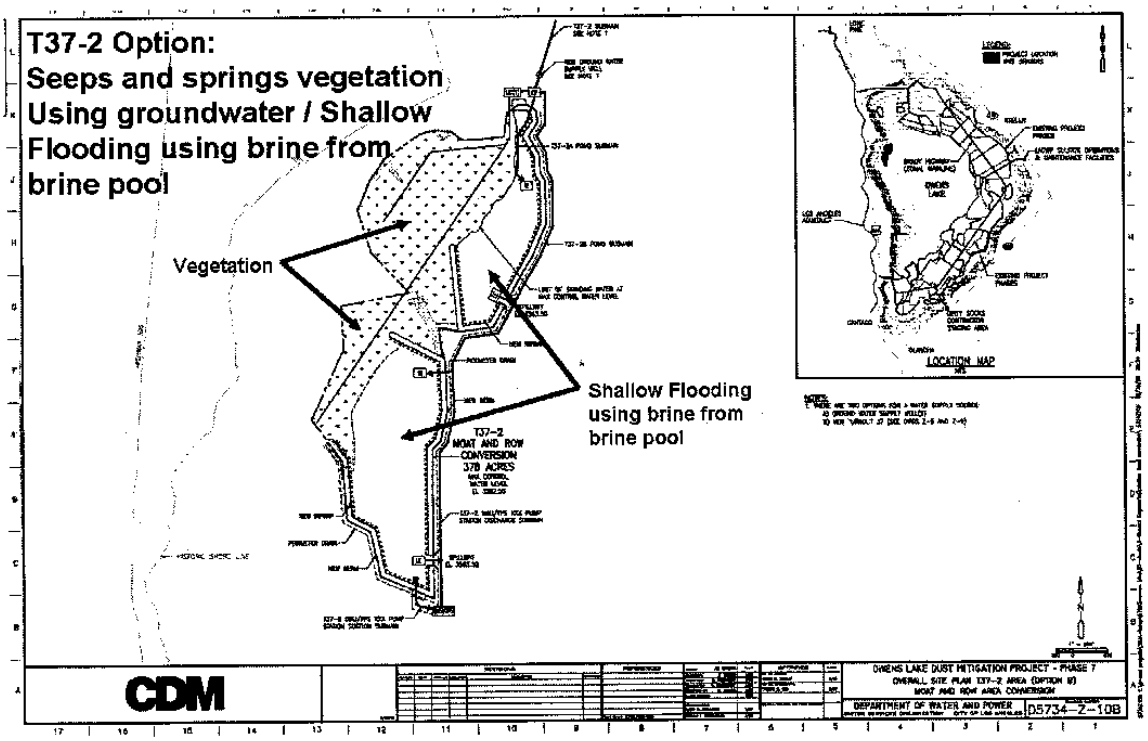
Moat and Row Area T37-2: 378 acres, Average MDCE = 89%

Characteristics:

Currently proposed to have 10.7 miles of Moat and Row, 5.1 miles of which includes sand fence. Moat and Row elements are spaced from 266 to 663 feet apart. Vegetation can be grown in the western portion of this area, but the larger eastern portion will not support vegetation growth. There is an existing well adjacent to this area that is privately owned. There is a narrow central corridor in this area that has existing seeps and springs type vegetation due to artesian flow from the well.

Options:

1. Area T37-2 may provide a unique opportunity for a hybrid solution comprised of seeps and springs type vegetation in the western portion and Shallow Flooding on the eastern portion served by brine from the adjacent brine pool. LADWP may be able to purchase sufficient water to support the vegetation portion from the adjacent landowner, although modifications such as a new well and associated facilities would likely be required. The Shallow Flooding portion would involve construction of perimeter containment berms and interior terraced berms. If Moat and Row berms are present (constructed with the new moat-less cross section), they could easily be converted into shallow flood berms. Brine supply options might include dredging a channel from the brine pool to T1A-3 where it would then be pumped via a stationary pumping station to interior cells. Alternatively, a floating pumping station (on a barge in the brine pool) could be used in conjunction with an above-ground flexible pipe to convey brine to the shallow flooding ponds. It may also be possible to transport dry or semi-dry salts for placement into the ponds which would then be mixed with fresh water to achieve the correct salt chemistry. An advantage to the use of brine is reduced evaporation reducing the overall water needed to maintain shallow flooding compliance.



Associated Considerations and Potential Issues Requiring Further Analysis:

- Ultimate water demand would need to be determined based on reduced evaporation, but also infiltration. There is a possibility that there would be sufficient water from the adjacent well to provide make-up water to the brine ponds in addition to serving the vegetation.
- Implementation would require substantial grading to flatten pond bottoms, well beyond the 33% allowed in the moat and row EIR
- Shallow Flooding with brine will not support habitat (similar in nature to the brine pool)
- If moat-less rows are constructed, the associated berms can be converted to shallow flooding berms.
- Considerable engineering will be needed to develop an appropriate brine conveyance system (pumps, pipes, channels etc.). Pilot testing to determine technical feasibility will be required.
- The brine pool is considered a federal waterway, and transferring it from one location on the lake bed to another would need to be explored from a permitting /legal perspective.
- The above factors would require additional CEQA analysis prior to implementation.
- It is unknown how much time would be required to assess technical challenges, permitting issues, and perform required CEQA analysis so implementation would not be possible prior to the October 2010 dust control compliance deadline. Furthermore, time needed to establish vegetation would further delay compliance in the vegetated portion of this area.