

A WETLANDS PLANNING ANALYSIS

JOHN HENRY NO.1 MINE IN KING COUNTY, WASHINGTON

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Mining operations including removal, transport, and subsequent replacement of topsoil, overburden, interburden, and waste material will significantly alter wetlands at the John Henry minesite. One goal of Pacific Coast Coal's mine reclamation program was the establishment of a detailed wetland restoration program. A requirement of this program was an actual net increase in the wetland habitat over the present system and a successful intergration of restoration with haulage and backfill configurations.

INTRODUCTION

Pacific Coast Coal Company's (PCCC) proposed John Henry No. 1 Mine is located in King County, Washington, approximately 43 km (27mi) southeast of Seattle. The permit area lies adjacent to, and partially within, the incorporation limits of the city of Black Diamond. The mine plan includes a 200 ha (500ac) mine area to be operated over a 16 year period. The proposed mining area is rolling topography covered by second growth and recently cut timberlands. One natural lake lies within the permit area, as does the remnants of a man-made lake that breached in 1971 and is now a wetlands. Present land uses within the proposed permit area are managed timberlands and wildlife habitat. Portions of the permit area and adjacent lands were extensively mined during the past 100 years. There is a small (10,000 short tpy) surface coal mine adjacent to the permit area with 2-3 years left in operation. Other uses

of the adjacent lands are permanent and seasonal residential development, commercial development, managed and unmanaged timberlands and wildlife habitat.

PCCC proposes to extract a combined total of 4.74 mt (5.32 million short tons) of run-of-mine coal from two pits during a 16.2 year period. Coal would be removed along an anticline to a depth of 76m (250ft) below ground surface in an open-pit mine configuration, advancing parallel to the geologic strike. Maximum annual production (250,000 short tpy) is anticipated to be reached at about the 6th year of mining and would continue through the 13th year. Final reclamation of all disturbance area will be accomplished by the 19th year of operation.

Mud Lake, a 10.4ha (26ac) marshy remnant of a man-made lake, would be impacted by the pit during the 6th year of mining activity. Although Mud Lake would be completely mined, PCCC proposes to restore the wetland characteristics of the area as part of the the toatal reclamation plan. The final reclamation plan includes a stable final cut lake/wetland system approximately 18ha (45ac) in size.

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SCOPE OF WORK

It is important that the specific design features for the lake/wetland system

reinforce post-mining land-use plans; to be compatible with existing and planned uses of the area; meet the requirements of federal, state and local regulations; and meet land-owner requirements. Conflicting requirements between agencies and interested parties were resolved through several meetings. Primary emphasis was placed upon maintaining environmental and economic values in the land.

Independent Ecological Services (IES) was contracted design the wetlands portion of the restoration. They, along with the Washington Department of Game (WDG) and King County Planning, determined the size of the existing wetland. Determinations based on the current size of the wetland, and the ability of the present wetland to maintain itself (the area that was expected to remain as wetland over a short time), and the expected capability to recreate a marsh that would be more stable than the existing system. An estimate of 6 ha (14ac) was established by WDG. A size between 5 and 5.6 ha (12.5-14ac) was determined by IES.

Final wetland location and configuration required the incorporation of specific design requirements recommended by interested parties and agencies. Site evaluation, review and analysis were based upon the following work schedule:

- 1) Detailed review of mine plans and reclamation schedules.
- 2) Site reconnaissance for evaluation of baseline conditions (vegetation types, water and soils depths, etc.).
- 3) Summarize primary geologic and geotechnical features as they relate to in-situ rocks, soils, and backfill stability.
- 4) Summarize hydrologic features and define the relationship of area drainage to the hydrologic system (water budget analysis).
- 5) Summarize similar reclamation or wetland creation projects to determine success and feasibility.

From the above information the basic location, dimension, and shape of the wetland can be determined. Further refinements of the restoration plan were accomplished with the following steps:

- 1) Preparation of a backfill sequence consistent with the mining plan and the lake/wetland system.
- 2) Design of preliminary grading plans for a lake/wetland configuration including such features as islands, channels, and dikes.

- 3) The physical, chemical and biological characteristics of the proposed final-cut wetlands and lake were analyzed for stability and water quality impacts.
- 4) Habitat enhancement features, such as resting and loafing areas for animals and spawning and rearing locations for fish, were added.
- 5) Plant species and revegetation techniques were determined based on pre-mining conditions of the marsh and other local lakes, wetlands, and streams.
- 6) Detailed drawings and cost estimates were prepared for the planned restoration program.
- 7) A final report was prepared.

Approximately 3 months were needed from preliminary investigation to report preparation. This schedule was aided by the availability of previously prepared wetland inventories for Mud Lake by PCCC and King County and several aerial photographs which showed stages of wetland succession.

PRE-MINING CONDITIONS

In 1968 Mud Lake was a shallow water reservoir with macrophyte growth in the shallow areas. The extreme east end of the lake merged into a forested stand with surface water flows that fed the lake. In 1971 the dam breached as a result of several large rainfall events and beaver dams in the only spillway. Subsequently, there was a rapid conversion of the lake bed to a sedge marsh with distinctive channels and some large open water areas in the central portions.

By 1974 the marsh had begun to develop a pattern of transition from lake to wetland. The central portion of the lake bed still supported an open water marsh with submergent growth and limited emergent growth. The east and west ends of the lake bed supported dense stands of sedge and rush. Hardhack and willow invaded the higher elevations around the periphery of the lake bed.

By 1977 the sedge community had been replaced by hardhack in the eastern and western slopes and apparent high spots within the lake bed.

By 1980 the hardhack and willow dominated a large portion of the west end of the lake, however, the channels and presence of sedges showed that the areas still had wetland characteristics. In many areas the wetland was changing from a herbaceous to wooded community, but the dominant species were still water dependent. An open water area visible on aerial photographs was actually a horsetail

(E. fluviatile) stand with a pocket of cattail (*Typha latifolia*) in the center. It is unique in this marsh, and must be a response to soil conditions or an upwelling of water since the terrain is level for some distance from the horsetail.

By 1981 the lake had taken on a more stable appearance. The alder, willow, and hardhack communities became slightly denser in succeeding years, but their spread had slowed and there were indications that the areas still void of these species were too wet to allow the shrubs to become established. There were still fairly defined channels leading from east to west. The areas with limited shrub growth displayed a sheet flow of water in March, 1983, with the greatest flow in the obscure channels. This indicated that the ground elevation was low enough to act as a broad channel during higher flows and to remain reasonably saturated for much of the year, particularly the growing season. There were still pockets of cattails at the east end of the lake bed. These are all indications of a stable herbaceous community.

The approximate areas of each community were calculated from aerial photographs. A site visit was made to confirm the interpretation of the different plant species. There were approximately 1.7 ha (4.2ac) of relatively pure stands of sedge, cattail, and horsetail (little or no shrub growth); 1 ha (2.5ac) of sedge/hardhack (hardhack is present, but sedge is still dominant); 2.4 ha (6.1ac) of willow, hardhack/sedge; and 2.6 ha (6.4ac) of alder/willow/hardhack. A total of 7.7 ha (19.3ac) of marsh and swamp wetlands were present.

PROJECTIONS USING BASELINE CONDITIONS

From 2 surveys of the lake, inspection of aerial photographs and the plant species list of the Game Department, the following conclusions were made concerning the probable short term (10 years) future of the wetland if there were no manipulated changes in surface of ground water flows.

- 1) The facts that the vegetative characteristics are basically the same after 20 months between 1981-1983, that shrub intrusion is only expanding in some places, and that certain areas devoid of shrubs in 1980 are still open indicate that vegetation growth is slowing and that certain areas will continue to be resistant to shrub growth until sediments and organic material raise the marsh elevation.
- 2) The cattail pockets and horsetail stand remained constant since 1977, indicating the presence

of deeper water areas that would resist shrub intrusion unless there was a change in surface water flows.

- 3) Secondary communities of shallower water sedges were becoming established along the periphery of the dominant open sedge marsh portions of the lake. At these same elevations further west in the lake bed alder and willow became well established. This indicates shallow subsurface groundwater or a surface flow that keeps this area wetter for a longer period of time.
- 4) There was a sheet flow of water completely across the sedge area during high water, with only a slight increase in velocity in the obscure channels in this area. This indicates that this area is deeper than the surrounding area and sufficient to discourage shrub growth.
- 5) Items 1 through 4 are indicators that a viable marsh/swamp wetland established itself in the Mud Lake bed from about 152m (500ft) west of the old lake boundary. Portions of this area would continue to progress through shrub stages to become wooded swamps, however, it is believed that approximately 2 ha (5ac) of the site would remain a sedge, sedge/hardhack marsh and about 3.2 ha (8ac) would remain in some form of shrub/tree wooded swamp. There is a high probability that the remaining 2.4-2.8 ha (6-7ac) would convert to a forested community of water tolerant trees such as alder, spruce, or cedar. Over the years clumps of trees or individual trees might become established on some of the higher areas within the shrub/tree swamp. *Salix scouleriana* could outcompete alder and other willows in some areas and create a dense, less productive habitat than a mixed tree community. Within 50 years the lake bed could fill with sediment and become a forested bog, which was its condition prior to damming. It might become blocked by a downed tree, sediment, or beaver dam and become a shallow pond/marsh. In any case, it is impossible to project that far ahead into the future. Therefore, the reclamation plan was

designed to mitigate existing or near future conditions.

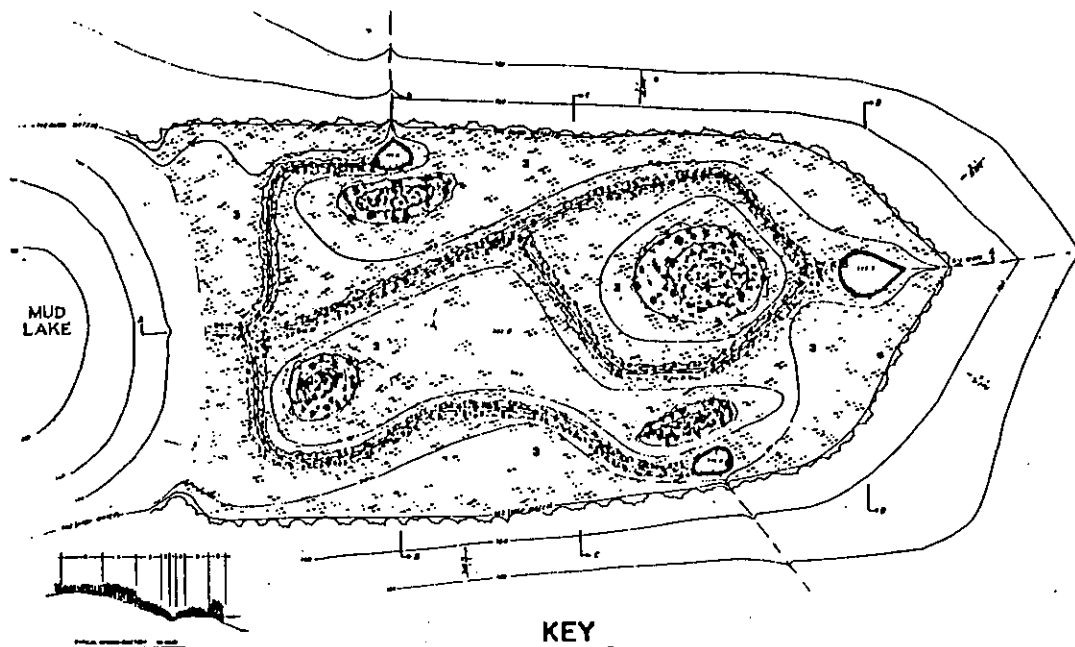
WETLAND/LAKE RECLAMATION PLAN

The final lake/wetland reclamation plan develops detailed methods for stabilizing a wetland area which is currently diminishing through natural processes, and for developing a 13 ha (32.5ac) lake (Fig. 1). The lake will be created by partially backfilling an open mine pit. Planned to be 15m (50ft) in depth, the lake will blend into a 5.2-5.6 ha (13-14ac) wetland at its shallower end. Three or four islands in the wetland will be located at the inlets of major surface water inflows to the area. These are expected to provide loafing and nesting areas for wildlife, diversity, and serve as water diversion structures to deflect surface water into the wetland. They will also serve as backup sediment collection areas. Deep sinks will be created at the inlets to the major surface water inflows to trap sediments, especially during the first years of reclamation. Vegetation will be selected from current vegetative conditions. Seeding or transplanting will occur during early fall following grading.

A water control structure will be installed to permit regulation of wetland flooding and to retain water in the wetland during summer low water periods. A bank designed to allow development of a border of water-tolerant deciduous shrubs and trees will be created along 3 sides of the wetland. This will provide wildlife habitat and help trap sediment from sheet surface flows down the sloped hillsides surrounding the wetland. The outlet from the lake/wetland will be improved by making the gradient less steep and gravel will be applied to form a streambed conducive to fish spawning.

SUMMARY

OSM regulations regarding approximate original contour, final cut lakes and excess spoil are neither conducive nor helpful in the creation of wetlands in reclaimed land. Restoration of lands in western Washington is much different than in other parts of the country. Because of the moisture, soils and temperature regrowth of vegetation is rapid. In many instances the invader species are also the climax species. Wetlands, by their own nature recover rapidly if water is available during the first one



KEY

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| 1 OPEN STREAM CHANNEL
WOTHELIU MAUIGRASS
RIGIDCARPUS | 5 EDGE (TOP OF ISLANDS)
SLOUGH GRASS |
| 2 BORDER OF STREAM CHANNEL
WATERPLANTAIN
SOFT STEM BULRUSH | 6 EDGE OF SEDIMENT SINK
HORSGETAIL
CATTAIL |
| 3 MAIN BODY OF WETLAND
SLOUGH SEDGE
INFLATED SEDGE
MARSH CIGUEROIL | 7 RIPARIAN BOROKE
RED ALDER
SCULLER'S WILLOW
PIPER'S WILLOW
HARDHACK
DOG LAUREL |
| 4 HIGHER AREAS IN MAIN WETLAND
REDROOT CYPERUS
SCIRPUS MICROCARPUS | |

MUD LAKE MARSH RECLAMATION PLAN

SOURCE: HOETON PENNIE & ASSOCIATES, INC.
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FIGURE 1

or two years after they have been disturbed. Projects in western Oregon and Washington have recovered after one growing season to a point where they are viable, stable wetlands with all the desired wetlands values, i.e. biofiltering, fish and wildlife habitat, and organic food material producers. With controlled water levels and a year around source of water, the proposed restored wetland will support fish and wildlife and clean surface water runoff within two growing seasons. As surface waters enter the wetland the species composition will change to reflect a typical wet coast shallow freshwater wetland with at least 25 different species of plants.

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