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**（变量名请以原文为准）**

# Instructions：

Disclaimer：免责声明bla bla bla。。。

|  |
| --- |
| Directions for use: |
| 1. Please make sure macros are activated. |
| 2. User inputs should be made only in the worksheets named 'User Input (Checklist)' and 'User Input (Env. Safeguard)'. Do not make any changes to the other worksheets. |
| 3. The information requested in the cells highlighted yellow must be provided. Default values are suggested in many cases, but the user should review these and make appropriate changes. |
| 4. Input cells which are not highlighted do not require an input. The values reported in these cells are explained under "Description". The user is encouraged to provide their own estimates instead of the suggested default values. However, if the default is calculated with an equation, that equation will be lost when a new value is typed in the cell. To return to the default equations and values, click [GO BACK TO DEFALUT VALUE]. |
| 5. After entering all data (including Environmental Safeguards - if desired), press the calculate button. |
| 6. Results are displayed under "Flushing Tech Results", "HSRS Tech Results" , and "Econ. Results & Conclusions." |

Directions for use：

1. 确认开启宏指令；
2. 只能在名字含有“User input”的工作表中使用用户输入，不要改变其他任何工作表；
3. 必须提供黄色标注单元格请求的信息，其中会有很多案例的推荐默认数值，但是用户应该了解这些以作出合适的修改；
4. 未标注的单元格不需要输入，这些单元格内的报告数值在“Description”包含了解释，欢迎用户提供自己的估计值而非建议的默认值。然而如果默认值被求均值，那么这个均值将会在单元格输入新的数值之后丢失，单击[GO BACK TO DEFAULT VALUE]恢复默认值；
5. 输入完所有数据之后（包括可选的环境保护），点击计算按钮；
6. 计算结果将会显示在“xxxx”工作表内。

# User Input(Checklist):

|  |  |  |  |
| --- | --- | --- | --- |
| Reservoir Geometry | |  |  |
| **Parameter** | **Units** | **Description** | **Value** |
| So | (m3) | Original (pre-impoundment) capacity of the reservoir  水库原（预蓄水）能力 |  |
| Se | (m3) | Existing storage capacity of the reservoir  水库现存蓄水量 |  |
| Wbot | (m) | Representative bottom width for the reservoir--use the widest section of the reservoir bottom near the dam to produce worst case for criteria  水库底部典型宽度——利用大坝附近水库底部最宽的断面产生标准的最坏情况 |  |
| SSres |  | Representative side slope for the reservoir. 1 Vertical to SSres Horizontal.  水库代表性坡度。1表示垂直于 SSres 水平方向。 | 2.0 |
| ELmax | (m) | Elevation of top water level in reservoir--use normal pool elevation.  水库顶部水位的提高——采用正常池高程（海拔？）。 |  |
| ELmin | (m) | Minimum bed elevation--this should be the riverbed elevation at the dam.  最小的河床高程应该是大坝的河床高程。 |  |
| ELf | (m) | Water elevation at dam during flushing - this is a function of gate capacity and reservoir inflow sequence. Lower elevation will result in a more successful flushing operation.  冲洗过程中大坝的水位高度——这是闸门容量和水库流入顺序的函数。较低的高度将导致更成功的冲洗操作。 |  |
| L | (m) | Reservoir length at the normal pool elevation.  正常池高程的水库长度 |  |
| h | (m) | Available head--reservoir normal elevation minus river bed downstream of dam  可用水库正常高程减去坝下游河床 | 0.0 |

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| Water Characteristics | |  |  |
| Vin | (m3) | Mean annual reservoir inflow (mean annual runoff)  年平均入流量（年平均流量） |  |
| Cv | (m3) | Coefficient of Variation of Annual Run-off volume. Determine this from statistrical analysis of the annual runoff volumes  年径流量的变化程度。从年径流量的统计分析确定这一点 |  |
| T | (oC) | Representative reservoir water temperature  典型水库水温 |  |

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| --- | --- | --- | --- |
| Sediment Characteristics | | |  |
| d | (tonnes/m3) | Density of in-situ reservoir sediment. Typical values range between 0.9 - 1.35.  水库底泥密度典型值，在0.9～1.35之间。 | 1.20 |
| Min | (metric tonnes) | Mean annual sediment inflow mass.  年平均输沙量 |  |
|  | 1600, 650, 300, 180 | Select from: 从其中选择 ： 1600 for fine loess sediments; 1600为细黄土沉积物； 650 for other sediments with median size finer than 0.1mm; 650为其他中值尺寸沉积物比0.1mm细  300 for sediments with median size larger than 0.1mm; 300为中值粒度大于0.1mm的沉积物  180 for flushing with Qf < 50 m3/s with any grain size. 180为用任何粒度的QF＜50 m3/s冲洗 | 650 |
| Brune Curve No | 1 2 3 | Is the sediment in the reservoir: 水库中的泥沙是：  (1) Highly flocculated and coarse sediment （1）高絮凝粗泥沙  (2) Average size and consistency （2）平均大小和一致性  (3) colloidal, dispersed, fine-grained sediment （3）胶体、分散、细粒沉积物 | 2 |
| Ans | 3 or 1 | This parameter gives the model a guideline of how difficult it will be to remove sediments. Enter "3" if reservoir sediments are significantly larger than median grain size (d50) = 0.1mm or if the reservoir has been impounded for more than 10 years without sediment removal. Enter "1" if otherwise.  这个参数为模型提供了去除沉积物的难度的指南。如果水库沉积物显著大于中值粒度（D50）＝0.1mm，或者如果水库被淤积超过10年而没有泥沙去除，则输入“3”。否则输入“1”。 | 3 |
| Type | 1 or 2 | Enter the number corresponding to the sediment type category to be removed by hydrosuction dredging: 1 for medium sand and smaller; 2 for gravel.  输入抽吸疏浚去除的沉积物类型对应的数字：中等砂和较小的1；砂砾2 | 1 |

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| **Removal Parameters** | |  |  |
| HP | 1 or 2 | Is this a hydroelectric power reservoir? Enter 1 for yes; 2 for no.  这是水力发电水库吗？输入1表示“是”；2为“否”。 |  |
| Qf | (m3/s) | Representative flushing discharge. This should be calculated with reference to the actual inflows and the flushing gate capacities.  典型冲洗流量。这应该参照实际的流入量和冲刷的容量来计算。 |  |
| Tf | (days) | Duration of flushing after complete drawdown.  水位下降后冲刷持续时间。 |  |
| N | (years) | Frequency of flushing events (whole number of years between flushing events)  冲洗事件的频率（冲洗事件之间的总年数） | 1 |
| D | (feet) | Assume a trial pipe diameter for hydrosuction. Should be between 1 - 4 feet.  液压抽吸的管道直径。应该在1到4英尺之间。 |  |
| NP | 1, 2, or 3 | Enter the number of pipes you want to try for hydrosuction sediment removal. Try 1 first; if hydrosuction cannot remove enough sediment, try 2 or 3.  输入您想要尝试的用于抽吸排泥的管道数量。先试1，如果吸力不能去除足够的沉积物，尝试2或3。 | 1 |
| YA | Between 0 and 1 | Maximum fraction of total yield that is allowed to be used in HSRS operations. This fraction of yield will be released downstream of the dam in the river channel. It is often possible to replace required maintenance flows with this water release. Enter a decimal fraction from 0 - 1.  允许在HSRS操作中使用的总产率的最大分数。这部分收益（效应？）将被释放到下游的大坝在河道中。通常可以用这种水释放来代替必要的维护流程。输入0到1的小数。 | 0.3 |
| CLF | (%) | Maximum percent of capacity loss that is allowable at any time in reservoir for Flushing. For an existing reservoir, this number must be greater than the percentage of capacity lost already. Sustainable solutions will attempt to remove sediment before this percent of the reservoir is filled completely.  水库冲沙时在任何时间允许的最大容量损失百分比。对于现有的储层，这个数字必须大于已经丧失的容量的百分比。可持续的解决方案将试图去除沉积物之前，这百分率的水库完全填补。 | 100 |
| CLH | (%) | Maximum percent of capacity loss that is allowable at any time in reservoir for Hydrosuction. For an existing reservoir, this number must be greater than the percentage of capacity lost already. Sustainable solutions will attempt to remove sediment before this percent of the reservoir is filled completely.  在水力抽吸中任何时间允许的最大容量损失。对于现有的储层，这个数字必须大于已经丧失的容量的百分比。可持续的解决方案将试图去除沉积物之前，这百分率的水库完全填补。 | 100 |
| CLD | (%) | Maximum percent of capacity loss that is allowable at any time in reservoir for Dredging. For an existing reservoir, this number must be greater than the percentage of capacity lost already. Sustainable solutions will attempt to remove sediment before this percent of the reservoir is filled completely.  库容常规挖沙在任何时间允许的最大容量损失百分比。对于现有的储层，这个数字必须大于已经丧失的容量的百分比。可持续的解决方案将试图去除沉积物之前，这百分率的水库完全填补。 | 100 |
| CLT | (%) | Maximum percent of capacity loss that is allowable at any time in reservoir for Trucking. For an existing reservoir, this number must be greater than the percentage of capacity lost already. Sustainable solutions will attempt to remove sediment before this percent of the reservoir is filled completely.  在trucking中任何时候允许的最大容量损失百分比。对于现有的储层，这个数字必须大于已经丧失的容量的百分比。可持续的解决方案将试图去除沉积物之前，这百分率的水库完全填补。 | 100 |
| ASD | (%) | Maximum percent of accumulated sediment removed per dredging event. Sustainable removal dredging will be subject to this technical constraint.  每个冲沙事件去除累积沉积物的最大百分比。可持续清除疏浚将受到这一技术约束。 | 100 |
| AST | (%) | Maximum percent of accumulated sediment removed per trucking event. Sustainable removal trucking will be subject to this technical constraint.  每次trucking事件累积沉积物的最大百分比。可持续搬迁运输将受到这一技术约束。 | 100 |
| MD | (m3) | Maximum amount of sediment removed per dredging event. The user is warned if this constraint is not met, but the program still calculates the NPV. Use default value unless better information is available.  每个冲沙事件去除的最大沉积物量。如果不满足此约束，则警告用户，但程序仍然计算净现值。除非有更好的信息，否则使用默认值。 | 1,000,000 |
| MT | (m3) | Maximum amount of sediment removed per trucking event. The user is warned if this constraint is not met, but the program still calculates the NPV. Use default value unless better information is available  每个truck事件的最大沉积物去除量。如果不满足此约束，则警告用户，但程序仍然计算净现值。除非有更好的信息，否则使用默认值 | 500,000 |
| Cw | (%) | Concentration by weight of sediment removed to water removed by traditional dredging. Maximum of 30%. Do not exceed this default unless you have studies for your reservoir showing different dredging expectations.  通过传统冲沙去除水中的沉淀物的重量浓度。最大值为30%。不要超过这个默认值，除非你对你的疏浚的研究显示出不同的疏浚期望。 | 30 |

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| **Economic Parameters** |  |  |  |
| **Parameter** | **Units** | **Description** | **Value** |
| E | 0 or 1 | If dam being considered is an existing dam enter 0. If the dam is a new construction project enter 1.  如果大坝被认为是现有的大坝输入0。如果大坝是新的建设项目输入1 |  |
| c | ($/m3) | Unit Cost of Construction. The default value given here is a crude estimate based on original reservoir storage capacity. The user is encouraged to replace this value with a project specific estimate.  施工单位成本。这里给出的默认值是基于原始储库容量的粗略估计。鼓励用户以项目特定的估计替换此值。 | #NUM! |
| C2 | ($) | Total Cost of Dam Construction. This cost is calculated as unit cost of construction times initial reservoir storage volume (C2 = So\*c\*E). If you entered E = 0 above, your total construction cost will be taken as 0; if you entered E = 1, this cost will be calculated in the above manner.  大坝施工总成本。该成本计算为施工单位时间的初始水库蓄积量（C2＝SO＊C\*E）。如果你输入上面的E＝0，你的总建筑成本将被视为0；如果你输入E＝1，这个成本将以上述方式计算。 | #NUM! |
| r | decimal | Discount rate贴现率 | 0.06 |
| Mr | decimal | Market interest rate that is used to calculate annual retirement fund. This could be different from discount rate "r".  用于计算年度退休基金的市场利率。这可能不同于贴现率“r” | 0.06 |
| P1 | ($/m3) | Unit Benefit of Reservoir Yield. Where possible use specific data for the poject. If no data is available refer to Volume 1 report for guidance.  单位产量效益在可能的情况下，使用特定的数据。如果没有可用的数据，请参考第1卷的指导。 | 0.2 |
| V | ($) | Salvage Value. This value is the cost of decommissioning minus any benefits due to dam removal. If the benefits of dam removal exceed the cost of decommissioning, enter a negative number.  救助价值。这个值是由于大坝拆除而减去任何效益的退役成本。如果大坝拆除的好处超过退役的费用，那么输入一个负数。 | 0 |
| omc |  | Operation and Maintenance Coefficient. This coefficient is defined as the ratio of annual O&M cost to initial construction cost. Total annual O&M cost is calculated by the program as C1= omc\*c\* So.  运行维护系数这个系数被定义为年度O＆M成本与初始建设成本的比率。每年的总成本和成本由程序计算为C1= OMC\*C\*SO。 | 0.01 |
| PH | ($/m3) | Unit value of water released downstream of dam in river by hydrosuction operations. This could be zero, but may have value if downstream released water is used for providing some of required yield.  水坝下游泄流水的单位取值这可以是零，但如果下游释放的水用于提供一些所需的产量，则可能具有价值。 | 0.02 |
| PD | ($/m3) | Unit value of water used in dredging operations. This could be zero, but may have value if settled dredging slurry water is used for providing some of required yield.  疏浚作业用水的单位价值。这可能是零，但可能有价值，如果结算疏浚泥浆水是用来提供一些所需的产量。 | 0.02 |
| CD | ($/m3) | Unit Cost of Dredging--The user is encouraged to input her/his own estimate. Should this be difficult at the pre-feasibility level, enter "N/A" to instruct the program to calculate a default value of the unit cost of dredging. The calculated value is reported in Econ. Results.& Conclusion Page.  疏浚单位成本-鼓励用户输入她自己的估算。如果这在预可行性级别上是困难的，输入“N/A”来指示程序计算疏浚单位成本的默认值。计算值在Econ报道。结果和结论页。 | 3.00 |
| CT | ($/m3) | Unit Cost of Trucking--The user is encouraged to input her/his own estimate. Should this be difficult at the pre-feasibility level, the default value is recommended.  运输的单位成本-鼓励用户输入自己的估计。如果在预可行性级别上是困难的，建议使用默认值 | 13.00 |

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| **Flushing Benefits Parameters** | |  |  |
| s1 | decimal | The fraction of Run-of-River benefits available in the year flushing occurs (s1 ranges from 0 to 1).  在一年中发生的河流效益的分数发生（S1范围从0到1） | 0.9 |
| s2 | decimal | The fraction of storage benefits available in the year flushing occurs (s2 ranges from 0 to1).  在一年中可获得的储存效益的分数（S2范围从0到1） | 0.9 |
|  |  |  |  |
| **Capital Investment** | |  |  |
| FI | $ | Cost of capital investment required for implementing flushing measures. The cost entered will be incurred when fliushing is first practiced.  实施冲洗（泄洪）措施所需的资本投资成本。输入费用将在首次实施时发生。 |  |
| HI | $ | Cost of capital investment to install Hydrosuction Sediment-Removal Systems (HSRS).  安装水力抽吸除沙系统（HSRS）的资本投资成本 |  |
| DU | Years | The expected life of HSRS.  HSRS的预期寿命。 | 25 |

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| This page is optional. Please proceed further only if you are interested in determining the impact of Environmental and Social Safeguard Policies on the selection of a desirable sediment management strategy; otherwise do not make any changes to this page. | | | | | | | |

# User Input (Env. Safeguard)

此页是可选的。如果您有兴趣确定环境和社会保障政策对选择一个理想的沉积物管理策略的影响，请继续进行，否则，不要对本页作出任何修改。

Safeguard ratings for each sediment management strategy are explained in Table 1. The value of 1 is assigned to no impact or to possible benefits, the value of 4 is the worst condition. Safeguard policy criteria that determine the maximum allowable environmental and social damage are reported in Table 2. These range from A to D are based on the sum of safeguard ratings and the maximum value of these ratings. Further guidance is available in RESCON report Vol.I.

表1中说明了每个沉积物管理策略的保障等级。1的值被指定为没有影响或可能的好处，4的值是最坏的条件。确定最大允许环境和社会损害的保障政策标准见表2。这些范围从A到D是基于保障等级和这些评级的最大值的总和。进一步的指导可在RESON报告V.I.

|  |  |
| --- | --- |
| **Table 1** |  |
| **Safeguard Ratings for Each Sediment Management Strategy**  **保护等级为每个沉积物管理策略** | **Safeguard Ratings** |
| No impact and potential benefits  没有影响和潜在的好处 | 1 |
| Minor impact  很小影响 | 2 |
| Moderate impact  中等影响 | 3 |
| Significant impact  重要影响 | 4 |

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| --- | --- | --- | --- | --- |
| **Table 2** |  |  |  |  |
| **Safeguard Policy Criteria**  **保障政策标准** | **Interpretation** | | | **Policy Level** |
| 6 | No impact and potential benefits | | | A |
| 7 to 11, with no 3's | Minor impact | | | B |
| 12 to 15 or at least one 3 | Moderate impact | | | C |
| 16 or higher, or at least 4. | Significant impact | | | D |

**Directions for Use:** Enter the safeguard ratings (1 to 4) in Table 3 and safeguard policy levels (A to D) in Table 4. The default values of safeguard ratings are taken as 1 and the safeguard policy level as D. These default values make all policies acceptable from social and environmental safeguard perspective.

使用说明：在表3中输入安全等级（1至4），并在表4中维护策略级别（A至D）。保护等级的默认值为1，保障政策级别为D。这些默认值使所有的政策都能从社会和环境保障的角度接受。

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| **Table 3** |  |  |  |  |  |  |  |  |
| **Estimated Environmental and Social Impact Levels** | |  |  |  |  |  |  |  |
| **Possible Strategies**  **可能的策略** | **Technique** | **Estimated Environmental & Social Impact Levels (Enter 1 to 4)**  **估计的环境和社会影响水平（输入1至4）** | | | | | | **TOTAL** |
| **Natural Habitats** | **Human Uses** | **Resettlement** | **Cultural Assets** | **Indigenous Peoples** | **Transboundary Impacts** |
| Nonsustainable (Decommission) with No Removal  不可持续的（不退役） | N/A | **1** | **1** | **1** | **1** | **1** | **1** | **6** |
| Nonsustainable (Decommission) with Partial Removal  部分切除的不可持续（退化） | HSRS | **1** | **1** | **1** | **1** | **1** | **1** | **6** |
| Nonsustainable (Run-of-River) with No Removal  不可持续的（奔流的河流） | N/A | **1** | **1** | **1** | **1** | **1** | **1** | **6** |
| Nonsustainable (Run-of-River) with Partial Removal  非连续（部分河流）部分切除 | HSRS | **1** | **1** | **1** | **1** | **1** | **1** | **6** |
| Sustainable 可持续的 | Flushing | **1** | **1** | **1** | **1** | **1** | **1** | **6** |
| Sustainable | HSRS | **1** | **1** | **1** | **1** | **1** | **1** | **6** |
| Sustainable | Dredging | **1** | **1** | **1** | **1** | **1** | **1** | **6** |
| Sustainable | Trucking | **1** | **1** | **1** | **1** | **1** | **1** | **6** |

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| --- | --- |
| **Table4** |  |
| **Safeguard Policy Criteria**  **保障政策标准** | **Policy Level** |
| Maximum allowable environmental and social damage (A to D)  最大允许环境和社会损害（a至d） | **D** |

# Flushing Tech Results

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| --- | --- | --- | --- | --- | --- | --- |
| Flushing Feasibility Criteria Calculations  冲洗（泄洪）可行性标准计算 | | |  |  |  |  |
|  |  |  |  |  |  |  |
|  | | | | | | |  |
|  |  |  |  |  |  |  |  |
| **Results Summary** |  |  |  |  |  |  |  |
| **The following are Atkinson's empirical criteria and guidelines. The required and suggested values, and calculated values for your user inputs are included. When the SBR criterion is met, the program will calculate economic results for your reservoir. Please also note the results of the other criterion and guidelines below.**  **以下是阿特金森的经验标准和指南。包括所需的和建议的值，以及用户输入的计算值。当SBR标准得到满足，程序将计算为您的水库经济效益。请注意下面的其他标准和指南的结果。** | | | | |  |  |  |
| **Criterion** | **Required** | **Calculated** | **Notes** |  |  |  |  |
| SBR | > 1 | **#DIV/0!** | Can be flushed if > 1, otherwise not. |  |  |  |  |
| LTCR | preferably > 0.35 | **#DIV/0!** | Use caution if < 0.35. |  |  |  |  |
| **Guidelines** | **Suggested** | **Calculated** | **Notes** |  |  |  |  |
| DDR | > 0.7 | #DIV/0! | Additional confirmation to assist in deciding whether flushing is feasible. |  |  |  |  |
| FWR | > 1 | #DIV/0! |  |  |  |  |
| TWR | ~ 1 | #DIV/0! |  |  |  |  |
| SBRd | > 1 | #DIV/0! |  |  |  |  |
| Helpful hint: If SBR is less than one: try increasing frequency of flushing by decreasing the value assigned to the parameter "N" on the User Inputs page.  有用的提示：如果SBR小于1：尝试通过减少分配给用户输入页面上的参数“n”的值来增加刷新频率 | | | | | | |  |
|  |  |  |  |  |  |  |  |
| **Conclusion** |  |  |  |  |  |  |  |
| **#DIV/0!** | | | | |  |  |  |
| Days of Complete Drawdown Flushing完成泄洪的天数 | **0** | days |  |  |  |  |  |
| Flushing Flowrate 流量 | **0** | (m3/s) |  |  |  |  |  |
| Max. Possible Mass Sediment Flushed per Event  最大可能的冲淤 | **#DIV/0!** | (metric tons) |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

# HSRS Tech Results

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Feasibility of Hyrdosuction Sediment-Removal Systems  超高压排沙系统的可行性研究(HSRS) | | | |  |  |  |  |  |
|  | | |  |  |  |  |  |  |
|  | | | | | |  |  |  |
|  | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **Tolerance Check公差检查=** |  | | | | | | | |
|
|
|  |  |  |  |  |  |  |  |  |
| **Results Summary** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Sediment Transport Rate, Qs泥沙输移率= | #DIV/0! | (m3/s) = | #DIV/0! | (metric tons/day) = | | **#DIV/0!** | (metric tons/yr) | |
| Reservoir Volume Restored水库容积恢复= | #DIV/0! | (m3/day) |  |  |  | **#DIV/0!** | m3/year |  |
| Mixture Velocity, Vm混合速度= | #DIV/0! | (m/s) |  |  |  |  |  |  |
| Mixture Flowrate, Qm混合流量= | #DIV/0! | (m3/s) |  |  |  |  |  |  |
| Sediment Concentration through Hydrosuction Pipe, C通过吸气管的含沙量= | #DIV/0! | (ppm) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **Conclusion** |  |  |  |  |  |  |  |  |
| **#DIV/0!** | | | | | | | | |

# Flushing Tech Calcs

|  |  |  |  |
| --- | --- | --- | --- |
| **Flushing Feasibility Criteria Calculations** | | |  |
| Developed from: | |  |  |
| Atkinson, E. 1996. The Feasibility of Flushing Sediment from Reservoirs, TDR Project R5839, Rep. OD 137. HR Wallingford. | | | |
|  |  |  |  |
| g | (m2/s) | Acceleration due to gravity (constant)（重力） | 9.8 |
|  |  |  |  |
| **Brune Trap Efficiency Calculation** **Brune阱效率计算** | | |  |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
| Brune\_ratio |  | Excel Calculates this value which will be used in calculating Brune Trap Efficiency.  Excel计算该值，用于计算Brune阱效率 | #DIV/0! |
| TE\_High | (%) | Excel Calculates Brune Curve trap efficiency using fits of high curve.  Excel利用高曲线拟合计算Brune曲线陷阱效率。 | #DIV/0! |
| TE\_Median | (%) | Excel Calculates Brune Curve trap efficiency using fits of median curve.  Excel利用中值曲线拟合计算Brune曲线陷阱效率。 | #DIV/0! |
| TE\_Low | (%) | Excel Calculates Brune Curve trap efficiency using fits of low curve.  Excel利用低曲线拟合计算Brune曲线陷阱效率。 | #DIV/0! |
| TE | (%) | Excel Assingns a value for Trap Efficiency from the 3 Brune Curve results using the user choice of High, Median or Low.  Excel AssNNS的陷阱效率从3 Brune曲线的结果使用用户选择的高，中位数或更低 | #DIV/0! |
|  |  |  |  |
| **Flushing Channel Side Slope and Flushing Water Surface Elevation Calculations**  **冲洗渠道边坡及冲洗水面高程计算** | | |  |
| **Parameter** | **Units** | **Description** | **Value** |
| SSs |  | Representative side slope for deposits exposed during flushing. This adjusted Migniot's equation often over-estimates side slopes by 10 times, so the equation was divided by 10 to obtain a more reasonable result.  冲洗时暴露的代表性边坡。这一调整后的Migniot方程常常超过10次估计的斜率，因此方程被除以10，以获得更合理的结果 | 0.67 |
| ELf | (m) | Water surface elevation at the dam during flushing (from user input sheet).  冲洗过程中水坝的水面高度（从用户输入表） | 0.0 |
|  |  |  |  |
| **SBR Calculations--The sediment balance ratio is the ratio of the sediment flushed annually to the sediment deposited annually:**  **SBR计算-沉积物平衡比是每年沉积物冲刷到沉积物每年沉积的比率：** | | | |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
| Wres | (m) | Representative top width of the reservoir upstream from the dam at the flushing water surface based on the reservoir bathymetry  基于库容测深的坝顶上游冲淤代表性顶宽 | 0.0 |
| Wf | (m) | The actual flushing width is estimated using a best-fit equation resulting from empirical data (Atkinson, 1996)  实际冲刷宽度使用经验数据（阿特金森，1996）得到的最佳拟合方程来估计。 | 0.0 |
| W | (m) | Representative width of flow for flushing conditions--Because the width at the bottom of the reservoir before impoundment may limit the channel width that can be achieved with flushing, Wres and Wf are compared to choose the smaller as the representative width of flow for flushing conditions  冲洗条件的代表性宽度——因为蓄水池底部的宽度可能限制冲洗的通道宽度，WRES和WF被比较，以选择较小的作为冲洗条件的代表性流动宽度。 | 0.0 |
| S |  | Estimated longitudinal water slope during flushing  冲洗过程中纵向水坡度的估算 | #DIV/0! |
| Qs | (tonnes/sec) | Sediment load during flushing--Corrected or not corrected depending on whether reservoir in question is similar or not similar to Chinese reservoirs in Atkinson's report (Ans)--note that 0.00006 < S < 0.016 according to Morris and Fan (1998) for this equation's development.  冲刷过程中的泥沙负荷——根据阿特金森的报告（ANS）中是否与中国水库相似或不相似而修正或不改正——注意Morris和范（1998）根据该方程的发展，指出0.00006＜S＜0.016。 | #DIV/0! |
| Mf | (tonnes) | Sediment mass flushed in a flushing event  一次冲淤的泥沙质量 | #DIV/0! |
| Mdep | (tonnes) | Sediment mass depositing between flushing events  冲淤间隔沉积的泥沙质量 | #DIV/0! |
| SBR |  | Sediment balance ratio is the ratio of the sediment flushed annually to the sediment depisited annually; must be greater than 1 for feasible conditions  泥沙平衡比是每年冲淤的比例，在可行的条件下必须大于1。 | #DIV/0! |
|  |  |  |  |
| **LTCR Calculations--The long term capacity ratio is a ratio of the scoured valley area to the reservoir area for the assumed simplified geometry:**  **LTCR计算-长期容量比是假定的简化几何形状的冲刷谷面积与储层面积的比值：** | | | |
| See Figure 10 of Atkinson for a sketch of the simplified trapezoidal cross section used in approximating the reservoir as a prismatic shape. A section at the dam site is used to determine the ratio of cross-sectional area for the channel formed by flushing  请参阅阿特金森的图10，用于简化近似梯形横截面的示意图，用于将储层近似为棱柱形。坝址处的断面用来确定冲刷通道的横截面积之比。 | | | |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
| Wtf | (m) | Scoured valley width at the top water level based on the representative flow width for flushing conditions  基于代表水流宽度的冲刷条件下顶部水位冲刷谷宽 | 0.0 |
| Wt | (m) | Reservoir width upstream from the dam at the top water level for the simplified geometry assumed:  水库坝顶上游的水库宽度为简化几何假定： | 0.0 |
| Af1 | (m2) | When Wtf <= Wt, the reservoir geometry does not constrict the width of the scoured valley; thus the scoured valley cross-sectional area is the average of the reservoir top width and the bottom scour width, multipied by the depth of flow in the scoured area  当WTF＜WT时，储层几何形状不限制冲刷谷的宽度；因此，冲刷谷截面积是储层顶部宽度和底部冲刷宽度的平均值，由冲刷区域中的流量的深度所决定。 | 0.0 |
| hm | (m) | When Wtf <= Wt, constricted scour valley dimension as shown in Atkinson Figure A4.2  当WTF <WT，收缩冲刷谷尺寸如阿特金森图A4.2所示 | 0.0 |
| ht | (m) | When Wtf <= Wt, constricted scour valley dimension as shown in Atkinson Figure A4.2  当WTF <WT，收缩冲刷谷尺寸如阿特金森图A4.2所示 | 0.0 |
| hf | (m) | When Wtf <= Wt, constricted scour valley dimension as shown in Atkinson Figure A4.2  当WTF <WT，收缩冲刷谷尺寸如阿特金森图A4.2所示 | 0.0 |
| Af2 | (m2) | When Wtf > Wt, the scoured valley is constricted as in Figure A4.2 of Atkinson; thus, a more complex geometry using hm, ht, and hf must be calculated to determine the scoured valley cross-sectional area  当WTF> WT时，冲刷谷被压缩成阿特金森的图A4.2；因此，必须计算更复杂的几何形状，使用HM、HT和HF来确定冲刷谷截面积。 | 0.0 |
| Af | (m2) | Scoured valley area applicable to this reservoir  适用于该水库的冲刷谷区 | 0.0 |
| Ar | (m2) | Reservoir cross-sectional area--estimated from the average of the reservoir top and bottom widths, multiplied by the total depth of water in the reservoir  储层截面积——从储层顶部和底部宽度的平均值估算，与储层的总水深相乘 | 0 |
| LTCR |  | Long term capacity ratio is a ratio of the scoured valley area to the reservoir area for the assumed simplified geometry; must be greater than 0.5 for feasible conditions  长期容量比是假定的简化几何形状的冲刷谷面积与库区的比值；对于可行条件，必须大于0.5。 | #DIV/0! |
|  |  |  |  |
| **DDR Calculation--The extent of reservoir drawdown is unity minus a ratio of flow depth for the flushing water level to flow depth for the normal impounding level:**  **DDR计算-水库水位下降的范围是单位减去冲洗水位的流量深度与正常蓄水水位的流量深度之比：** | | | |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
| DDR |  | DDR must be greater than 0.7 for drawdown to be sufficient  DDR必须大于0.7，以足以弥补。 | #DIV/0! |
|  |  |  |  |
| **FWR Calculation--Flushing width ratio checks that the predicted flushing width, Wf, is greater than the representative bottom width of reservoir, Wbot:** **FWR计算- Flushing宽度比检查预测的冲洗宽度WF大于储层的代表底部宽度，Wbot：** | | | |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
| FWR |  | FWR must be greater than 1; if not, see TWR calculations  FWR必须大于1；如果不是，参见TWR计算 | #DIV/0! |
|  |  |  |  |
| **TWR Calculations--TWR checks that the scoured valley width at top water level for complete drawdown is greater than the reservoir top width:**  **TWR计算- TWR检查在完全水位下降的顶部水位冲刷谷宽度大于储层顶部宽度：** | | | |
| Steep side slopes in the scoured valley will be a constraint when 1) FWR is a constraint, or 2) reservoir bottom widths are small when compared to the top widths at full storage level. The reservoir top width ratio, TWR, quantifies a side slope constrain  当1）FWR是一个约束时，在冲刷谷中陡峭的边坡将是一个约束，而与全存储水平上的顶部宽度相比，储层底部宽度小。储层顶部宽度比TWR量化边坡约束 | | | |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
| Wbf | (m) | Wbf is the bottom width of the scoured valley at full drawdown. It is the minimum of Wbot and Wf  WBF是冲刷谷的底部宽度在完全下降。它是WBOT和Wf的最小值 | 0.0 |
| Wtd | (m) | Wtd is the scoured valley width at top water level if complete drawdown is assumed  WTD是假定水位完全下降时顶部水位的冲刷谷宽度。 | 0.0 |
| TWR |  | Checks that the scoured valley width at top water level for complete drawdown is greater than the reservoir top width; If FWR is a constraint, should have TWR > 2. If FWR not a constraint, TWR approaching 1 sufficient.  检查顶部水位下的冲刷谷宽度是否大于储层顶部宽度；如果FWR为约束，则应具有TWR＞2。如果FWR不是约束，TWR接近1足够 | #DIV/0! |
|  |  |  |  |
| **SBRd Calculations--SBRd is the sediment balance ratio based on flushing flows; it is independent of drawdown**  **SBRD计算——SBRd是基于冲洗水流的泥沙平衡比，它与水位下降无关** | | | |
| SBRd is calculated the same as SBR, except ELf = Elmin | | |  |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
| Wres | (m) | A representative top width of the reservoir upstream from the dam at the flushing water surface based on the reservoir bathymetry  基于水库水深测量的坝顶上游溢洪道代表性顶宽 | 0.0 |
| Wf | (m) | The actual flushing width is estimated using a best-fit equation resulting from empirical data (Atkinson, 1996)  实际冲刷宽度使用经验数据（阿特金森，1996）得到的最佳拟合方程来估计 | 0.0 |
| W | (m) | The representative width of flow for flushing conditions--Because the width at the bottom of the reservoir before impoundment may limit the channel width that can be achieved with flushing, Wres and Wf are compared to chose the smaller as the representative width of flow for flushing conditions  冲洗条件下水流的代表宽度——因为蓄水前底部的宽度可能限制冲刷所能达到的通道宽度，因此比较WRES和WF，选择较小的水流作为冲洗条件的代表宽度 | 0.0 |
| S |  | The estimated longitudinal water slope during flushing  冲洗过程中纵向水坡度的估算 | #DIV/0! |
| Qs | (tonnes/sec) | Sediment load during flushing--Corrected or not corrected depending on whether reservoir in question is similar or not similar to Chinese reservoirs in Atkinson's report--note that 0.00006 < S < 0.016 according to Morris and Fan (1998) for this equation's development.  冲刷过程中的泥沙负荷——根据阿特金森的报告中是否与中国水库相似或不相似——根据Morris和樊（1998）对该方程的发展指出0.00006＜S＜0.016 | #DIV/0! |
| Mf | (tonnes) | Sediment mass flushed annually每年冲淤的泥沙质量 | #DIV/0! |
| Mdep | (tonnes) | Sediment mass depositing annually which must be flushed每年必须被冲淤的泥沙成绩质量 | #DIV/0! |
| SBRd |  | Sediment balance ratio is the ratio of the sediment flushed annually to the sediment depisited annually; must be greater than 1 for feasible conditions  泥沙平衡比是每年冲淤的比例，在可行的条件下必须大于1。 | #DIV/0! |

# HSRS Tech Cals

|  |  |  |  |
| --- | --- | --- | --- |
| **Hydrosuction Pipeline Sizing to Determine Feasibility of Hyrdosuction Sediment-Removal Systems (HSRS)**  **抽水管道定径确定高压输沙系统（HSRS）的可行性** | | |  |
| Developed from the following paper and direct comments from Hotchkiss:  从下面的论文和Hotchkiss的直接评论 | | |  |
| Hotchkiss, Rollin H., Xi Huang. 1995. Hydrosuction Sediment-Removal Systems (HSRS): Principles and Field Test.  抽吸式排沙系统（HSRS）：原理和现场试验。 | | |  |
| Journal of Hydraulic Engineering, June 1995, pp. 479-489.  水利工程学报，1995年6月，第479—489页。 | | |  |
|  |  |  |  |
| **User Input Values converted to English Units:**  **转换为英文单位的用户输入值：** | | |  |
| **Parameter参数** | **Required Units**  **必需单位** | **Description 描述** | **Value** |
| h | (ft) | Available head--reservoir water surface elevation at normal pool minus tailwater elevation on downstream side of dam or other determined hydrosuction pipe outlet location  可用主水库正常水池水面抬高减水坝下游尾水抬高或其他确定的抽水管道出口位置 | 0 |
| L | (ft) | Pipeline length from location of hydrosuction operations to tailwater or other determined outlet location  从抽水作业位置到尾水或其他确定出口位置的管道长度 | 0 |
| d | (lb/ft3) | Density of reservoir in situ sediment  水库底泥密度 | 75 |
| w | (lb/ft3) | Density of water  水的密度 | 62.4 |
| Q | (cfs) | Assume a trial flowrate through pipe  管道预估流量 | 25 |
|  |  |  |  |
| **Assumed Values in English Units for the Following Input Parameters (Step 1 of Hotchkiss and Huang, 1995):**  **下列输入参数的英文单位的假设值** | | |  |
| **Parameter** | **Required Units** | **Description** | **Value** |
| g | (ft2/s) | Acceleration due to gravity (constant)  重力加速度（常数） | 32.2 |
|  | (ft) | Roughness height--assuming steel pipe material, this is equivalent sand roughness.  粗糙度高度——假设钢管材质，相当于砂糙度。 | 0.00015 |
| sg |  | Sediment specific gravity in HSRS pipe: 2.65 for quartz (sand and gravel); 2.8 for silt&clay.  HSRS管道沉积物比重：石英（砂石）2.65；淤泥和粘土2.8。 | 2.65 |
| sumKi |  | Assumed total minor energy loss coefficient for possible minor losses in the hydrosuction piping system. Minor losses include energy losses at entrance, exit, bends, connections, and valves. Table 2 (hidden) used to estimate each minor loss. Losses summed  假设总的小能量损失系数，可能的小损失在吸气管道系统。较小的损失包括入口、出口、弯曲、连接和阀门的能量损失。表2（隐藏）用于估计每个小损失。损失总和 | 6.0 |
| d100 | (mm) | Grain size for which 100 percent of reservoir sediment sample is finer.  粒度为100%的较细的水库泥沙样品。 | 9.5000 |
| d90 | (mm) | Grain size for which 90 percent of reservoir sediment sample is finer.  粒度为90%的较细的水库泥沙样品。 | 3.6000 |
| d65 | (mm) | Grain size for which 65 percent of reservoir sediment sample is finer.  粒度为65%的较细的水库泥沙样品 | 1.3000 |
| d50 | (mm) | Grain size for which 50 percent of reservoir sediment sample is finer.  粒度为50%的较细的水库泥沙样品 | 0.7300 |
| d30 | (mm) | Grain size for which 30 percent of reservoir sediment sample is finer.  粒度为30%的较细的水库泥沙样品 | 0.4200 |
|  |  |  |  |
| **General Calculations** |  |  |  |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
| Apipe | (ft2) | Trial pipe cross-sectional area.  试管截面面积。 | 0.0 |
| V | (fps) | Trial velocity through pipe.  通过管道试验速度。 | #DIV/0! |
|  | (ft2/s) | Kinematic Viscosity for assumed temperature. Equation from Yang (1996) is empirical using temperature. (Assumes atmospheric pressure.)  假设温度下的运动粘度。杨氏方程（1996）是温度的经验公式。（假设大气压力） | 1.935E-05 |
|  |  |  |  |
| **Remaining Step 2. Determine Drag Coefficient (Cd) for each size fraction and then a weighted composite Cd using an iterative process.**  **剩余步骤2。确定每个尺寸分数的阻力系数（CD），然后使用迭代过程加权复合CD。** | | | |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
| Cd100 |  | Assumed Cd for d100 grain size.  假设镉D100晶粒尺寸。 | 1.0 |
| Cd90 |  | Assumed Cd for d90 grain size.  假设镉D90晶粒尺寸。 | 1.0 |
| Cd65 |  | Assumed Cd for d65 grain size.  假设镉D65晶粒尺寸。 | 1.0 |
| Cd50 |  | Assumed Cd for d50 grain size.  假设镉d50晶粒尺寸。 | 2.0 |
| Cd30 |  | Assumed Cd for d30 grain size.  假定镉D30晶粒尺寸。 | 4.0 |
| Cd |  | Composite Cd for sediment sample  沉积物样品复合镉 | 2.07 |
| 100 | (fps) | Fall velocity for d100 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D100颗粒的下降速度。 | 1.49 |
| 90 | (fps) | Fall velocity for d90 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D90颗粒的下降速度。 | 0.92 |
| 65 | (fps) | Fall velocity for d65 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D65颗粒的下降速度。 | 0.55 |
| 50 | (fps) | Fall velocity for d50 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D50颗粒的下降速度。 | 0.29 |
| 30 | (fps) | Fall velocity for d30 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D30颗粒的下降速度。 | 0.16 |
| Re100 |  | Reynold's Number for d100 using its fall velocity  D100利用雷诺速度的雷诺数 | 2394 |
| Re90 |  | Reynold's Number for d90 using its fall velocity  利用下降速度的D90雷诺 | 558 |
| Re65 |  | Reynold's Number for d65 using its fall velocity  D65利用雷诺速度的雷诺数 | 121 |
| Re50 |  | Reynold's Number for d50 using its fall velocity  用下降速度计算D50的雷诺数 | 36 |
| Re30 |  | Reynold's Number for d30 using its fall velocity  用下降速度计算D30的雷诺数 | 11 |
|  |  | Assume shape factor for most natural sands applies here  假设大多数天然砂的形状因子适用于这里 | 0.7 |
| Cd100 |  | Calculates updated Cd from Reynold's Number for d100.  从D100的雷诺数计算更新的CD。 | 1.16 |
| Cd90 |  | Calculates updated Cd from Reynold's Number for d90.  从D90的雷诺数计算更新的CD。 | 1.10 |
| Cd65 |  | Calculates updated Cd from Reynold's Number for d65.  从D65的雷诺数计算更新的CD。 | 1.32 |
| Cd50 |  | Calculates updated Cd from Reynold's Number for d50.  从Dy50的雷诺数计算更新的CD。 | 2.15 |
| Cd30 |  | Calculates updated Cd from Reynold's Number for d30.  从D30的雷诺数计算更新的CD。 | 4.38 |
| Cd |  | Updated composite Cd for sediment sample  沉积物样品更新复合镉 | 2.32 |
| 100 | (fps) | Updated fall velocity for d100 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D100粒径的下降速度。 | 1.38 |
| 90 | (fps) | Updated fall velocity for d90 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D90晶粒尺寸的下降速度。 | 0.87 |
| 65 | (fps) | Updated fall velocity for d65 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D65晶粒尺寸的下降速度。 | 0.48 |
| 50 | (fps) | Updated fall velocity for d50 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D50粒度的下降速度。 | 0.28 |
| 30 | (fps) | Updated fall velocity for d30 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D30颗粒的下降速度。 | 0.15 |
| Re100 |  | Updated Reynold's Number for d100 using its fall velocity  D100利用其下降速度更新雷诺数 | 2219 |
| Re90 |  | Updated Reynold's Number for d90 using its fall velocity  利用下降速度更新D90的雷诺数 | 531 |
| Re65 |  | Updated Reynold's Number for d65 using its fall velocity  D65利用其下降速度更新雷诺数 | 105 |
| Re50 |  | Updated Reynold's Number for d50 using its fall velocity  用下降速度更新D50的雷诺数 | 35 |
| Re30 |  | Updated Reynold's Number for d30 using its fall velocity  用下降速度更新D30的雷诺数 | 10.6 |
| Cd100 |  | Updates Calculation of Cd from Reynold's Number for d100.  从D100的雷诺数计算CD的更新。 | 1.16 |
| Cd90 |  | Updates Calculation of Cd from Reynold's Number for d90.  从D90的雷诺数计算CD的更新。 | 1.10 |
| Cd65 |  | Updates Calculation of Cd from Reynold's Number for d65.  从D65的雷诺数计算CD的更新。 | 1.38 |
| Cd50 |  | Updates Calculation of Cd from Reynold's Number for d50.  从D50的雷诺数计算CD的更新。 | 2.19 |
| Cd30 |  | Updates Calculation of Cd from Reynold's Number for d30.  D30中雷诺数计算CD的更新 | 4.52 |
| Cd |  | Updated composite Cd for sediment sample  沉积物样品更新复合镉 | 2.39 |
| 100 | (fps) | Updated fall velocity for d100 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D100粒径的下降速度。 | 1.38 |
| 90 | (fps) | Updated fall velocity for d90 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D90晶粒尺寸的下降速度。 | 0.87 |
| 65 | (fps) | Updated fall velocity for d65 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D65晶粒尺寸的下降速度。 | 0.47 |
| 50 | (fps) | Updated fall velocity for d50 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D50粒度的下降速度。 | 0.28 |
| 30 | (fps) | Updated fall velocity for d30 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D30颗粒的下降速度。 | 0.15 |
| Re100 |  | Updated Reynold's Number for d100 using its fall velocity  D100利用其下降速度更新雷诺数 | 2223 |
| Re90 |  | Updated Reynold's Number for d90 using its fall velocity  利用下降速度更新D90的雷诺数 | 531 |
| Re65 |  | Updated Reynold's Number for d65 using its fall velocity  D65利用其下降速度更新雷诺数 | 103 |
| Re50 |  | Updated Reynold's Number for d50 using its fall velocity  用下降速度更新D50的雷诺数 | 34 |
| Re30 |  | Updated Reynold's Number for d30 using its fall velocity  用下降速度更新D30的雷诺数 | 10 |
| Cd100 |  | Updates Calculation of Cd from Reynold's Number for d100.  从D100的雷诺数计算CD的更新。 | 1.16 |
| Cd90 |  | Updates Calculation of Cd from Reynold's Number for d90.  从D90的雷诺数计算CD的更新。 | 1.10 |
| Cd65 |  | Updates Calculation of Cd from Reynold's Number for d65.  从D65的雷诺数计算CD的更新。 | 1.38 |
| Cd50 |  | Updates Calculation of Cd from Reynold's Number for d50.  从D50的雷诺数计算CD的更新。 | 2.20 |
| Cd30 |  | Updates Calculation of Cd from Reynold's Number for d30.  D30中雷诺数计算CD的更新 | 4.57 |
| Cd |  | Updated composite Cd for sediment sample  沉积物样品更新复合镉 | 2.40 |
| 100 | (fps) | Updated fall velocity for d100 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D100粒径的下降速度。 | 1.38 |
| 90 | (fps) | Updated fall velocity for d90 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D90晶粒尺寸的下降速度。 | 0.87 |
| 65 | (fps) | Updated fall velocity for d65 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D65晶粒尺寸的下降速度。 | 0.47 |
| 50 | (fps) | Updated fall velocity for d50 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D50粒度的下降速度。 | 0.28 |
| 30 | (fps) | Updated fall velocity for d30 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D30颗粒的下降速度。 | 0.15 |
| Re100 |  | Updated Reynold's Number for d100 using its fall velocity  D100利用其下降速度更新雷诺数 | 2222 |
| Re90 |  | Updated Reynold's Number for d90 using its fall velocity  利用下降速度更新D90的雷诺数 | 531 |
| Re65 |  | Updated Reynold's Number for d65 using its fall velocity  D65利用其下降速度更新雷诺数 | 103 |
| Re50 |  | Updated Reynold's Number for d50 using its fall velocity | 34 |
| Re30 |  | Updated Reynold's Number for d30 using its fall velocity | 10 |
| Cd100 |  | Updates Calculation of Cd from Reynold's Number for d100.  从D100的雷诺数计算CD的更新。 | 1.16 |
| Cd90 |  | Updates Calculation of Cd from Reynold's Number for d90. | 1.10 |
| Cd65 |  | Updates Calculation of Cd from Reynold's Number for d65. | 1.39 |
| Cd50 |  | Updates Calculation of Cd from Reynold's Number for d50. | 2.20 |
| Cd30 |  | Updates Calculation of Cd from Reynold's Number for d30. | 4.58 |
| Cd |  | Updated composite Cd for sediment sample  沉积物样品更新复合镉 | 2.41 |
| 100 | (fps) | Updated fall velocity for d100 grain size using equation determined from force balance on sediment particle.  利用泥沙颗粒力平衡方程确定D100粒径的下降速度。 | 1.38 |
| 90 | (fps) | Updated fall velocity for d90 grain size using equation determined from force balance on sediment particle. | 0.87 |
| 65 | (fps) | Updated fall velocity for d65 grain size using equation determined from force balance on sediment particle. | 0.47 |
| 50 | (fps) | Updated fall velocity for d50 grain size using equation determined from force balance on sediment particle. | 0.28 |
| 30 | (fps) | Updated fall velocity for d30 grain size using equation determined from force balance on sediment particle. | 0.15 |
| Re100 |  | Updated Reynold's Number for d100 using its fall velocity  D100利用其下降速度更新雷诺数 | 2222 |
| Re90 |  | Updated Reynold's Number for d90 using its fall velocity | 531 |
| Re65 |  | Updated Reynold's Number for d65 using its fall velocity | 103 |
| Re50 |  | Updated Reynold's Number for d50 using its fall velocity | 34 |
| Re30 |  | Updated Reynold's Number for d30 using its fall velocity | 10 |
| Cd100 |  | Updates Calculation of Cd from Reynold's Number for d100.  从D100的雷诺数计算CD的更新。 | 1.16 |
| Cd90 |  | Updates Calculation of Cd from Reynold's Number for d90. | 1.10 |
| Cd65 |  | Updates Calculation of Cd from Reynold's Number for d65. | 1.39 |
| Cd50 |  | Updates Calculation of Cd from Reynold's Number for d50. | 2.20 |
| Cd30 |  | Updates Calculation of Cd from Reynold's Number for d30. | 4.59 |
| **Cd** |  | **Updated composite Cd for sediment sample** | **2.41** |
|  |  |  |  |
| **Steps 3 - 8, where: Step 3. Determines parameters needed to calculate the non-flow parameter, ; Step 4. Estimates headloss gradient through the hydrosuction pipe, based on the initial guess for pipe diameter and flowrate and minor loss estimation; Step**  **步骤3 - 8，其中步骤3。确定计算非流动参数所需的参数，（步骤4）。基于管道直径和流量的初始猜测和轻微损失估计，估计通过水头管道的水头损失梯度；步骤；** | | | |
| **Parameter** | **Units** | **Description** | **Calculated Value** |
|  |  | Calculate  from Hotchkiss equation (2):（用XXXX方程计算） | #DIV/0! |
| K |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of K, based in .  K的值取决于的数值 | #DIV/0! |
| m |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of m, based in .  m的值取决于的数值 | #DIV/0! |
|  |  | Non-flow parameter, , is a combination of non-flow variables from Hotchkiss equation (8):  非流动参数，是来自Hotchkiss方程（8）的非流动变量的组合： | #DIV/0! |
| Jm | (ft/ft) | Calculated headloss gradient in hydrosuction pipe  吸气管的计算水头损失梯度 | #DIV/0! |
| Re |  | Reynold's number for the mixture flow in the pipe.  管内混合流动的雷诺数。 | #DIV/0! |
| f |  | Equation developed from Moody diamgram yields trial friction factor value.  由穆迪模型得到的方程产生试验摩擦因子值。 | #DIV/0! |
| Qs | (cfs) | Maximum sediment transport rate under available headloss gradient, calculated using Hotchkiss (1996) equation (12).  利用HooChKiss（1996）方程（12）计算最大可用输沙率梯度下的最大输沙率。 | #DIV/0! |
| Vm | (fps) | Calculates trial optimum mixture flow velocity from Hotchkiss equation (11).  用Hotchkiss方程（11）计算试验最佳混合流速。 | #DIV/0! |
| Rm |  | Calculates the mixture flow Reynold's number.  计算混合流动雷诺数。 | #DIV/0! |
| fm |  | Calculates the mixture friction coefficient, fm, using the explicit formula given by Swamee and Jian (Streeter and Wylie, 1985) [Hotchkiss equation (14)].  利用Swamee和Jian（Streeter和怀利，1985）给出的显式公式计算混合摩擦系数Fm（HooChess方程（14））。 | #DIV/0! |
|  |  |  |  |
| **Step 9: Using Vm, Excel recalculates Jm and fm, and compares with value of fm calculated in step 8. Repeats steps 3 through 8 until the difference between fm values calculated in subsequint steps is within acceptable tolerance (usually 2-3 iterations).**  **第9步：使用VM，Excel重新计算JM和FM，并与步骤8中计算的FM值进行比较。重复步骤3到8，直到在后续步骤中计算的FM值之间的差值在可接受的公差内（通常2-3次迭代）。** | | | |
| **FIRST ITERATION of Steps 3-8** | |  |  |
| **Parameter** | **Units** | **Description（翻译同上）** | **Calculated Value** |
|  |  | Update  from Hotchkiss equation (2): | #DIV/0! |
| K |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of K, based in . | #DIV/0! |
| m |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of m, based in . | #DIV/0! |
|  |  | Update non-flow parameter, , is a combination of non-flow variables from Hotchkiss equation (8): | #DIV/0! |
| Jm | (ft/ft) | Update headloss gradient in hydrosuction pipe | #DIV/0! |
| Qs | (cfs) | Update maximum sediment transport rate under available headloss gradient, calculated using Hotchkiss (1996) equation (12). | #DIV/0! |
| Vm | (fps) | Updates trial optimum mixture flow velocity from Hotchkiss equation (11). | #DIV/0! |
| Rm |  | Updates the mixture flow Reynold's number. | #DIV/0! |
| fm |  | Updates the mixture friction coefficient, fm, using the explicit formula given by Swamee and Jian (Streeter and Wylie, 1985) [Hotchkiss equation (14)]. | #DIV/0! |
|  |  |  |  |
| **SECOND ITERATION of Steps 3-8** | |  |  |
| **Parameter** | **Units** | **Description（翻译同上）** | **Calculated Value** |
|  |  | Update  from Hotchkiss equation (2): | #DIV/0! |
| K |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of K, based in . | #DIV/0! |
| m |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of m, based in . | #DIV/0! |
|  |  | Update non-flow parameter, , is a combination of non-flow variables from Hotchkiss equation (8): | #DIV/0! |
| Jm | (ft/ft) | Update headloss gradient in hydrosuction pipe | #DIV/0! |
| Qs | (cfs) | Update maximum sediment transport rate under available headloss gradient, calculated using Hotchkiss (1996) equation (12). | #DIV/0! |
| Vm | (fps) | Updates trial optimum mixture flow velocity from Hotchkiss equation (11). | #DIV/0! |
| Rm |  | Updates the mixture flow Reynold's number. | #DIV/0! |
| fm |  | Updates the mixture friction coefficient, fm, using the explicit formula given by Swamee and Jian (Streeter and Wylie, 1985) [Hotchkiss equation (14)]. | #DIV/0! |
|  |  |  |  |
| **THIRD ITERATION of Steps 3-8** | |  |  |
| **Parameter** | **Units** | **Description（翻译同上）** | **Calculated Value** |
|  |  | Update  from Hotchkiss equation (2): | #DIV/0! |
| K |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of K, based in . | #DIV/0! |
| m |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of m, based in . | #DIV/0! |
|  |  | Update non-flow parameter, , is a combination of non-flow variables from Hotchkiss equation (8): | #DIV/0! |
| Jm | (ft/ft) | Update headloss gradient in hydrosuction pipe | #DIV/0! |
| Qs | (cfs) | Update maximum sediment transport rate under available headloss gradient, calculated using Hotchkiss (1996) equation (12). | #DIV/0! |
| Vm | (fps) | Updates trial optimum mixture flow velocity from Hotchkiss equation (11). | #DIV/0! |
| Rm |  | Updates the mixture flow Reynold's number. | #DIV/0! |
| fm |  | Updates the mixture friction coefficient, fm, using the explicit formula given by Swamee and Jian (Streeter and Wylie, 1985) [Hotchkiss equation (14)]. | #DIV/0! |
|  |  |  |  |
| **FOURTH ITERATION of Steps 3-8** | |  |  |
| **Parameter** | **Units** | **Description（翻译同上）** | **Calculated Value** |
|  |  | Update  from Hotchkiss equation (2): | #DIV/0! |
| K |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of K, based in . | #DIV/0! |
| m |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of m, based in . | #DIV/0! |
|  |  | Update non-flow parameter, , is a combination of non-flow variables from Hotchkiss equation (8): | #DIV/0! |
| Jm | (ft/ft) | Update headloss gradient in hydrosuction pipe | #DIV/0! |
| Qs | (cfs) | Update maximum sediment transport rate under available headloss gradient, calculated using Hotchkiss (1996) equation (12). | #DIV/0! |
| Vm | (fps) | Updates trial optimum mixture flow velocity from Hotchkiss equation (11). | #DIV/0! |
| Rm |  | Updates the mixture flow Reynold's number. | #DIV/0! |
| fm |  | Updates the mixture friction coefficient, fm, using the explicit formula given by Swamee and Jian (Streeter and Wylie, 1985) [Hotchkiss equation (14)]. | #DIV/0! |
|  |  |  |  |
| **FIFTH ITERATION (Final) of Steps 3-8** | | |  |
| **Parameter** | **Units** | **Description（翻译同上）** | **Calculated Value** |
|  |  | Update  from Hotchkiss equation (2): | #DIV/0! |
| K |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of K, based in . | #DIV/0! |
| m |  | Zandi and Govatos (1967), according to Hotchkiss, determined the value of m, based in . | #DIV/0! |
|  |  | Update non-flow parameter, , is a combination of non-flow variables from Hotchkiss equation (8): | #DIV/0! |
| Jm | (ft/ft) | Update headloss gradient in hydrosuction pipe | #DIV/0! |
| Qs | (cfs) | Update maximum sediment transport rate under available headloss gradient, calculated using Hotchkiss (1996) equation (12). | #DIV/0! |
| Vm | (fps) | Updates trial optimum mixture flow velocity from Hotchkiss equation (11). | #DIV/0! |
| Rm |  | Updates the mixture flow Reynold's number. | #DIV/0! |
| fm |  | Updates the mixture friction coefficient, fm, using the explicit formula given by Swamee and Jian (Streeter and Wylie, 1985) [Hotchkiss equation (14)]. | #DIV/0! |
|  |  |  |  |
| **Results Summary** |  |  |  |
| Tolerance Check =  公差检查 | #DIV/0! |  |  |
| Sed. Trans. Rate, Qs/pipe = | #DIV/0! | (cfs) |  |
| = | #DIV/0! | (yd3/day) |  |
| = | #DIV/0! | (US tons/day) based on in situ sediment weight , e.g. s ~ 1.2. |  |
| Sed. Trans. Rate, Qs,total = | #DIV/0! | (cfs) |  |
| = | #DIV/0! | (yd3/day) |  |
| = | #DIV/0! | (US tons/day) based on in situ sediment weight , e.g. s ~ 1.2. |  |
| Mix. Velocity, Vm = | #DIV/0! | (fps) |  |
| Mix. Flowrate, Qm/pipe = | #DIV/0! | (cfs) |  |
| = | #DIV/0! | (tons/day) based on specific weight of water (w = 62.5, sg = 1) |  |
| Mix. Flowrate, Qm/pipe = | #DIV/0! | (cfs) |  |
| = | #DIV/0! | (tons/day) based on specific weight of water (w = 62.5, sg = 1) |  |
| Conc. In Pipe, C = | #DIV/0! | (ppm) |  |

# Econ. Results & Conclusions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Economic Results & Conclusions  经济结果与结论 | **enter dam name and run identifier here**  **在这里输入大坝名称和运行标识符** | | |  |
| **Table1: Economic Results** |  |  |  |  |
| **Summary** |  |  |  |  |
| **Possible Strategies** | **Technique** | **Aggregate Net Present Value总净现值** | |  |
| Do nothing | N/A | 12577270694 | |  |
| Nonsustainable (Decommissioning) with Partial Removal  部分移除的不可持续（退役） | HSRS | 12583626734 | |  |
| Nonsustainable (Run-of-River) with No Removal  不可持续的（奔流的河流） | N/A | 12578811165 | |  |
| Nonsustainable (Run-of-River) with Partial Removal  非连续（部分河流）部分移除 | HSRS | 12585080008 | |  |
| Sustainable 可持续的 | Flushing | 12742911786 | |  |
| Sustainable | HSRS | Total Removal with HSRS is technically infeasible, See Partial Removal with HSRS | |  |
| Sustainable | Dredging | 13337754292 | |  |
| Sustainable | Trucking | 12731443784 | |  |
|  | | | |  |
|  |
| **Economic Conclusion:** |  |  |  |  |
| Strategy yielding the highest aggregate net benefit:  获得最高总净收益的策略 | Sustainable | |  |  |
| Technique yielding the highest aggregate net benefit:  产生最高总净效益的技术： | Dredging | |  |  |
| The highest aggregate net benefit is: $  最高总收益 | 1.334E+10 | |  |  |
|  | | | |  |
|  |  |  |  |  |
| **Detailed Results:** |  |  |  |  |
|  |  |  |  |  |
| **Nonsustainable (Decommission)** |  |  |  |  |
|  |  |  |  |  |
| # of years until Partial Removal Option with HSRS is practiced:  用HSRS进行部分移除直到部分移除选项被实施的年数 | | | 1 | years |
| # of years until retirement for Decommission-with No Removal Option:  没有移除选项退役到退休的时间： | | | 127 | years |
| # of years until retirement for Decommission: Partial Removal Option with HSRS:  退役直到退役的年数：HSRS的部分移除选项： | | | 128 | years |
| Remaining reservoir capacity at retirement for Decommission-with No Removal Option:  退役时剩余水库库容不拆除的选择： | | | 269,318 | m3 |
| Remaining reservoir capacity at retirement for Decommission: Partial Removal Option with HSRS:  退役剩余储集能力：HSRS部分去除方案： | | | 180,437 | m3 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Annual Retirement Fund Payment for nonsustainable options: Decommission  不可持续期权的年度退休基金支付：退役 | | | 0 | $ |
| Annual Retirement Fund Payment for nonsustainable options:Partial Removal with HSRS  不可持续期权的年度退休基金支付：HSRS部分去除 | | | 0 | $ |
|  |  |  |  |  |
| **Nonsustainable (Run-of-River)** |  |  |  |  |
|  |  |  |  |  |
| # of years until Partial Removal Option with HSRS is practiced:  用HSRS进行部分移除直到部分移除选项被实施： | | | 1 | years |
| Approximate # of years until dam is silted for Run-of-River-with No Removal Option:  大约几年的时间，直到大坝被淤泥围着河流运行，没有移除选项： | | | 128 | years |
| Approximate # of years until dam is silted for Run-of-River-with Partial Removal Option: 大约几年的时间，直到坝被淤泥运行River部分去除选项： | | | 129 | years |
|  |  |  |  |  |
| **Sustainable** |  |  |  |  |
|  |  |  |  |  |
| Long term reservoir capacity for Flushing  Flushing长期蓄水能力研究 | | | 34,418,491 | m3 |
| Long term reservoir capacity for HSRS | | | Not applicable | m3 |
| Long term reservoir capacity for Dredging | | | 99,208,487 | m3 |
| Long term reservoir capacity for Trucking | | | 98,416,973 | m3 |
|  |  |  |  |  |
|  |  |  |  |  |
| Approximate大概的 # of years until dam is sustained at long term capacity for Flushing | | | 290 | years |
| Approximate # of years until dam is sustained at long term capacity for HSRS | | | Not applicable | years |
| Approximate # of years until dam is sustained at long term capacity for Dredging | | | 2 | years |
| Approximate # of years until dam is sustained at long term capacity for Trucking | | | 32 | years |
|  | | |  |  |
| Approximate # of Flushing events until dam is sustained at long term capacity | |  | 9 | times |
|  |  |  |  |  |
|  |  |  |  |  |
| **Technical Conclusions based on Economics:** |  |  |  |  |
| Table 2 below includes frequency of removal event if the given sustainable outcome had the highest aggregate net benefit. The cycle is the number of years between removal events; often the first cycle is different from remaining cycles, depending on whether the reservoir is new or existing or what percent of reservoir is allowed to fill before event occurs. Note that if flushing frequency is reported, it is not necessarily the same as the frequency input by the user as variable "N"; rather, it is the economically optimal flushing frequency.  下面的表2包括如果给定的可持续结果具有最高的总净收益的去除事件的频率。该循环是在去除事件之间的年数；通常第一个循环与剩余的循环不同，这取决于储层是新的还是现有的，或者在发生事件之前允许储层的百分之几。注意，如果报告冲洗频率，它不一定与用户输入的变量为“n”相同，而是经济上最佳的冲洗频率。 | | | |  |
| **Table 2: Frequency of Removal** | |  |  |  |
| **Strategy** | **Technique** | **Cycle/Phase** | **Frequency of Removal (years)** |  |
| Nonsustainable-with Partial Removal  部分移除不可持续 | HSRS | Annual cycle | 1 |  |
| Run-of-River (Nonsustainable)-with Partial Removal  河流的运行（不可持续）-部分去除 | HSRS | Annual cycle | 1 |  |
| Sustainable 可持续的 | Flushing | Phase I （相位） | 29 |  |
| Sustainable | Flushing | Phase II | 4 |  |
| Sustainable | HSRS | Annual cycle | Not applicable |  |
| Sustainable | Dredging | Phase I | 2 |  |
| Sustainable | Dredging | Phase II | 2 |  |
| Sustainable | Trucking | Phase I | 32 |  |
| Sustainable | Trucking | Phase II | 31 |  |
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| Table 3 below includes quantity of sediment removal per event if the given sustainable outcome had the highest aggregate net benefit. Note that when removal occurs, the same quantity is removed after each cycle.  下面的表3包括每一事件的沉积物去除量，如果给定的可持续结果具有最高的总净效益。注意，当发生移除时，在每个周期之后移除相同的量。 | | | |  |
| **Table 3: Sediment Removed per Event** |  |  |  |  |
| **Strategy （翻译同上）** | **Technique** | **Cycle/Phase** | **Sediment Removed (m3)** |  |
| Nonsustainable-with Partial Removal\* | HSRS | Annual cycle | 5,533 |  |
| Run-of-River (Nonsustainable)-with Partial Removal | HSRS | Annual cycle | 5,533 |  |
| Sustainable | Flushing | Phase I | 18,117,336 |  |
| Sustainable | Flushing | Phase II | 3,166,053 |  |
| Sustainable | HSRS | Annual cycle | Not applicable |  |
| Sustainable | Dredging | Phase I | N/A |  |
| Sustainable | Dredging | Phase II | 1,583,027 |  |
| Sustainable | Trucking | Phase I | N/A |  |
| Sustainable | Trucking | Phase II | 24,536,914 |  |
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| Table 4 below indicates the values for fraction of accumulated sediment removed (ASD or AST) and fraction of reservoir capacity lost (CLF,CLD,CLT) at the time removal event occurs. Note that these values are likely to be only approximate because of discrete stepsizes and possible rounding errors.  下面的表4表明在时间去除事件发生的累积沉积物去除分数（ASD或AST）和水库容量损失分数（CLF，CLD，CLT）的值。注意，这些值可能只是近似的，因为离散步长和可能舍入误差。 | | | |  |
| **Table 4: Optimal（最优的）**  **values of ASD/AST and CLF/CLD/CLT** |  |  |  |  |
| **Technique** | **ASD/AST(%)** | **CLF/CLD/CLT** |  |  |
| Flushing(Phase I) | Varies | 69 |  |  |
| Flushing(Phase II) | 5 |  |  |
| HSRS | N/A | N/A |  |  |
| Dredging(Phase I) | N/A | 2 |  |  |
| Dredging(Phase II) | 100 |  |
| Trucking(Phase I) | N/A | 25 |  |  |
| Trucking(Phase II) | 97 |  |
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| **Technical Comments--Please scroll down to see all comments**  **技术评论-请向下滚动查看所有评论** | |  |  |  |
| Average expected concentration of sediment to water flushed per flushing event:  平均冲淤浓度对冲水事件的影响： | | | #DIV/0! | ppm |
| Average expected concentration of sediment to water released downstream of dam per hydrosuction event:  每一次抽水事件下坝下游沉积物对水的平均期望浓度： | | | HSRS not technically feasible | ppm |
| Average expected concentration of sediment to water removed from reservoir per dredging event:  每一次疏浚水库沉积物对水的平均期望浓度： | | | 300,000 | ppm |
| Note: Because reservoir is dewatered prior to a trucking event and river is diverted during a trucking event, material removed is moist sediment (negligible water).  注：因为在卡车运输之前，水库被脱水，在运输过程中河流被转移，除去的物质是潮湿的沉积物（可忽略的水）。 | | | | |
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| The physical maximum limit for removal of sediment with trucking, MT, specified in the User Input page, is being exceeded. Decrease AST or increase MT.  超过了用户输入页面中指定的载货汽车MT的沉淀物的最大物理极限。减少AST或增加MT。 | | | |  |
| Please examine Table 5 below and determine whether the number of truck loads can be accommodated at your site in the time allowed (the maximum is one year).  请检查下面的表5，并确定卡车载重的数量是否可以在允许的时间内容纳在您的站点（最大值是一年）。 | | | |  |
| **Table 5: Number of Truck Loads\* Required to Complete Sustainable Sediment Trucking Removal Option**  **表5：完成可持续的沉积物运输移除选项所需的卡车负荷数量** | | |  |  |
| **Truck Model Number** | **m3/Truck Load** | **Number of Loads(Phase I)** | **Number of Loads(Phase II)** |  |
| 769D | 16.2 | N/A | 1,514,624 |  |
| 771D | 18 | N/A | 1,363,162 |  |
| 773D | 26 | N/A | 943,727 |  |
| 775D | 31 | N/A | 791,513 |  |
| 777D | 42.1 | N/A | 582,825 |  |
| 785B | 57 | N/A | 430,472 |  |
| 789B | 73 | N/A | 336,122 |  |
| 793C | 96 | N/A | 255,593 |  |
| \*1997. Caterpillar Performance Handbook, Ed. 28. CAT Publication by Caterpillar Inc., Peoria, Illinois, USA. October 1997. | | |  |  |
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| The physical maximum limit for removal of sediment with dredging, MD, specified in the User Input page, is being exceeded. Decrease ASD or increase MD.  超过了在用户输入页面中指定的疏浚沉积物的物理最大极限，超过了用户输入页面中指定的MD。减少ASD或增加MD。 | | | |  |
| Table 6 indicates a number of dredges required to remove the optimally determined removed sediment. The highest sediment volume removal by dredging that can be expected from a typical system over a year is approximately\* 11 Mm3. To remove more sediment, additional dredges could possibly be installed on a reservoir, but this would increase the overall cost of the project. Based on this gross estimate of sediment removal capability, the number of dredges to remove enough sediment annually to keep your reservoir sustainable is shown in Table 6 below.  表6表示需要去除最佳确定的去除沉积物的疏浚器的数量。通过一个典型的系统一年内可以预计的疏浚沉积物去除量最高为约11立方毫米。为了去除更多的沉积物，可以在水库上安装额外的挖泥船，但这会增加整个工程的成本。基于对沉积物去除能力的总体估计，挖泥船每年清除足够的沉积物以保持水库的可持续性的数量见下表6。 | | | |  |
| Note that the approximated removal per dredge is very crude; site specific analysis must be done to confirm volume of sediment removal per dredge per year.  注意每疏浚物的近似去除是非常粗糙的；必须进行特定地点的分析以确认每年每疏浚物的沉积物去除量。 | | | |  |
| **Table 6: Number of Dredges Required to Complete Sustainable Sediment Dredging Removal Option**  **表6：完成可持续沉积物疏浚移除选项所需的挖泥船数量** | | |  |  |
| **Volume Removed per Dredge疏浚量**  **(m3/Dredge)** | **No. of Dredges(Phase I)** | **No. of Dredges (Phase II)** |  |  |
| 11,000,000 | N/A | 1 |  |  |
| \*Calculated assuming dredging mixture velocity through pipe = 5 m/s, diameter of dredge pipe=0.8 m, reservoir length is <4 km,dam height is <30 m, and dredge runs 70% of time.  ＊通过管道疏浚混合流速计算，计算值为5 m/s，疏浚管直径为0.8 m，蓄水长度为4 km，坝高小于30 m，疏浚运行70%。 | | | | |
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| **Table 7: Unit Cost of Sediment Removal表7：去除泥沙的单位成本** |  |  |  |  |
|  |  |  |  |  |
|  | **Phase I** | **Phase II** |  |  |
| **Unit Cost of Dredging($/m3)**  **疏浚单位成本（$/m3）** | N/A | 3.00 |  |  |
| **Unit Cost of HSRS($/m3)** | #DIV/0! | |  |  |

# Safeguard Results

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| **Safeguard Results**  **保障结果** |  |  |  |  |  |  |  |
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| **Possible Strategies（上有类似翻译）** | **Techniques** | **Sum of Safeguard Ratings** | **Maximum of Safeguard Ratings** | **Results** | **Conclusion** | **Aggregate NPV of Accepted Strategies** | |
| Nonsustainable (Decommissioning)-with No Removal  不可持续（退役）-不移除 | N/A | 6 | 1 | A | Accepted | 1.25773E+10 | |
| Nonsustainable (Decommissioning)-with Partial Removal  不可持续（退役）-部分移除 | N/A | 6 | 1 | A | Accepted | 1.25836E+10 | |
| Nonsustainable (Run-of-River)-with No Removal  不可持续的（运行River）-不移除 | HSRS | 6 | 1 | A | Accepted | 1.25788E+10 | |
| Nonsustainable (Run-of-River)-with Partial Removal | HSRS | 6 | 1 | A | Accepted | 1.25851E+10 | |
| Sustainable 可持续的 | Flushing | 6 | 1 | A | Accepted | 1.27429E+10 | |
| Sustainable | HSRS | 6 | 1 | A | Accepted | Total Removal with HSRS is technically infeasible, See Partial Removal with HSRS | |
| Sustainable | Dredging | 6 | 1 | A | Accepted | 1.33378E+10 | |
| Sustainable | Trucking | 6 | 1 | A | Accepted | 1.27314E+10 | |
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| **Highest NPV without Safeguard Policy**  **无保障政策的最高净现值** | Strategy | Sustainable 可持续的 | | | |  |  |
|  | Technique | Dredging 疏浚 | | | |  |  |
|  | NPV | 1.334E+10 | | | |  |  |
|  |  |  |  |  |  |  |  |
| **Highest NPV with Safeguard Policy** | Strategy | Sustainable | | | |  |  |
|  | Technique | Dredging | | | |  |  |
|  | NPV | 1.33378E+10 | | | |  |  |
|  |  |  |  |  |  |  |  |
| **Economic opportunity cost of implementing Environmental Safeguard**  **实施环境保护的经济机会成本** | | |  |  |  |  |  |
|  |  | 0 | | |  |  |  |